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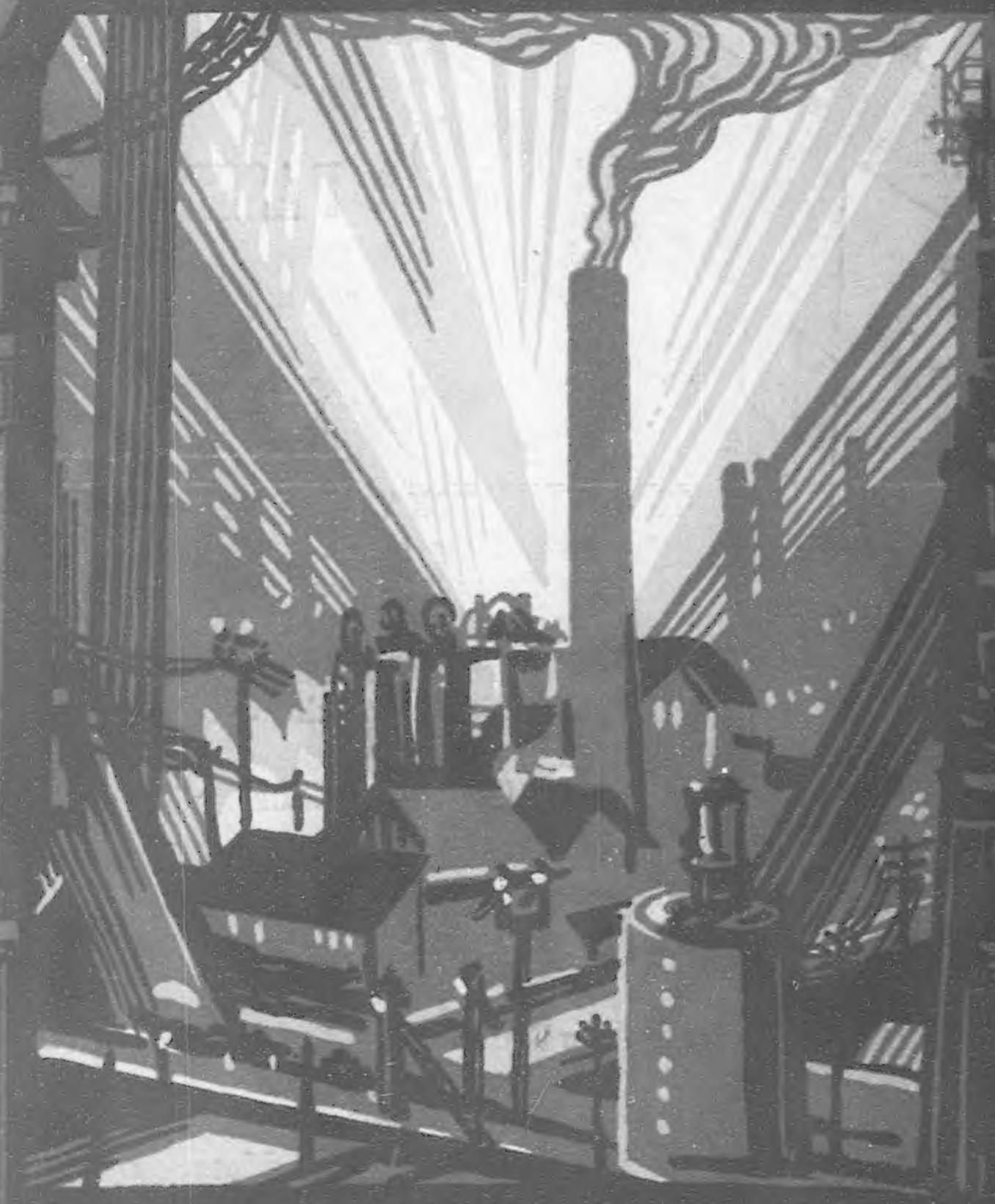

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ASIATIC MARINE REVIEW

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N.Y.K.

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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXVI SHANGHAI, JULY, 1930 No. 7

After Swallowing A String of Double Humped Camels—

ON June 17, the Northern Rebel Government of China seized the Tientsin Customs, ousted the Nationalist officials and diverted to its own treasury all revenues in excess of the percentage earmarked for the service of foreign loans. Unable to enforce its authority in the seceded provinces or establish an effective blockade of the Northern ports, Nanking retaliated by declaring the port of Tientsin closed to commerce. The inability of Nanking to exercise jurisdiction over the seceded territory has compelled the foreign ministers to accept the accomplished fact and recognize the belligerancy of the Northern Coalition. There is nothing strange or unusual in this situation. The same thing has happened in nearly every civil war, or rebellion against recognized authority since governments were established.

The situation in China differs only in that its Maritime Custom's revenues have been pledged as security for a series of foreign loans and the surplus as security for further domestic issues, unsecured obligations and commercial debts. Any interference with the Custom's Administration that would divert its revenues from the service of these loans, must inevitably lead to national bankruptcy. The unity of the Chinese Maritime Customs has therefore become the sole remaining symbol of China's credit at home and abroad, the one reliable source of income that has hitherto escaped pillage by contending war-lords or semi-independent provincial governments.

The provision of the Anglo-German loan agreement of 1898 that the administration of the Maritime Customs should not be changed during the life of the loan, imposed foreign control of the Custom's revenue until 1943. In 1898, a further agreement with Great Britain was reached whereby the Chief Inspector of the Maritime Customs Administration should be British as long as British trade predominates in China. Now that Germany has no further direct interest in these agreements, the burden of responsibility for their faithful observance devolves largely upon the British Government. The seizure of the Tientsin Customs, the appointment of a British subject as its Chief Inspector and the diversion of the revenues (over and above the five per cent. earmarked for the service of foreign loans) into Yen's war-chest, has been the subject of yards of news reports, editorial condemnation and official thunderings.

The Nanking authorities have not failed to take full advantage of this agitation to save the unity of the Customs, being careful however not to place themselves on record as favoring any action that might at some future time be used as a precedent to justify similar steps when the situation may be reversed. Mr. T. V. Soong, the Nationalist Minister of Finance very clearly expressed the attitude of Nanking when he said :

"The forcible seizure of the Tientsin Customs by agents of the militarists constitutes a serious blow to national credit, endangering all future plans of financial rehabilitation as well as the existing foreign and domestic obligations secured on the Customs. The Tientsin Commissioner, Colonel Hayley-Bell, has maintained the best traditions of the service in refusing to allow the disruption of the integrity of the Customs. Steps are however being taken which will insure the collapse of this phase of militarist adventure very shortly.

"The desperate act of the Northern militarists in trying to destroy the only possible instrument of national credit is sufficient refutation of any confidence in their own claim that they would very shortly be able to overthrow the National Government, and establish a government of their own."

Brushing aside the propaganda cobwebs, an issue is revealed that differs in no important particular from many similar incidents arising in the past from rebel control of territory involving a recognition of their belligerent rights and status as a *de facto* government. As long as the Shansi Coalition controls the territory north of the Yellow River and sets up a government of its own and the recognized Government of China at Nanking is unable to put down the rebellion and re-establish its authority over the seceded territory, foreign governments have no alternative but to accept the accomplished fact. No question of sympathy or support with one side or the other enters into the legal aspects of such a situation. Until Nanking can reassert its authority north of the Hwang-ho, the belligerency of Shansi and its right to collect and dispose of the revenues under its control cannot be set aside except by forcible foreign intervention, a solution that even the most ardent Nationalist would hesitate to advocate.

Foreign editorial opinion on the Tientsin Customs incident is largely influenced by geographical considerations and environment. In the North, the Feng-Yen organs and even the independent press are enthusiastic over the success of the *coup*, while in Shanghai, the stronghold of the Nationalists, editorial comment has to be more conservative and guarded. Any honest presentation of the situation from whatever political angle, must face squarely the basic issue of the sanctity of agreements and the rights of a belligerent and *de facto* rebel government. The first leads up to the application of the only remedy to preserve the unity of the Customs while any discussion of the second is unpalatable to a Government which has applied a rigorous censorship over the war situation.

But there is another angle to the Tientsin Customs incident which has been overlooked in the welter of Nanking and Shansi propaganda. After all that has happened these past few years in China, it is difficult for an impartial observer to differentiate between the sanctity of a loan secured on the Customs revenues of China and similar obligations secured on railway, salt or other state revenues. Why should the inviolability of the Customs be of greater concern than the wrecking of other equally important revenue producing services hypothecated for the repayment of foreign loans ? Chinese militarists have with impunity flagrantly violated other loan agreements providing safeguards for the protection of the foreign bondholder : why should they not also collect the customs revenues in their respective bailiwicks ?

If one agreement or treaty can be annulled at the will of a war-lord, why not another ? The principle remains the same. It is still more difficult to understand why Chinese militarist interference with the Customs should take precedence over the impairment or whittling away of other treaty safeguards for the protection of the foreigner in China. The amount of money involved in the preservation of these treaty rights is many times greater than the outstanding bonds secured on the Customs revenues, yet the Powers have signified their willingness to surrender these treaty safeguards and their diplomatic representatives are now seriously discussing with the Chinese Minister of Foreign Affairs how and when the final recognition of China's full sovereignty can be safely conceded. Why, then, get excited over a minor issue ?

Millions of Chinese may starve to death in far-off Shensi ; millions more may be rendered homeless and without the means of sustaining life in other districts ; hundreds of thousands of defenceless people can be butchered and their women carried away

into slavery by roving Communist and bandit hordes ; whole cities, towns and villages can be sacked, looted, laid waste and given to the flames ; civil war after civil war can complete the ruination of the country and the misery of its people, and the world looks on with indifference ! Foreigners in China can be murdered by these bandit and communist armies ; they can be abducted, tortured, starved, maltreated and held for ransom ; their women can be violated ; their churches desecrated ; their schools and philanthropies destroyed ; their ships pirated and fired upon ; their flags insulted ; their treaty rights trampled under foot, and their governments will simply file a perfunctory protest and wait for the next outrage to provide some diplomat with the opportunity of exercising his talents in phrasing another *billet-doux* to the Chinese Foreign Office. Foreign railway loans can be defaulted ; the lines and equipment confiscated by military satraps for their own use ; the Salt Gabelle can be wrecked ; bills for materials supplied to the Chinese Government can remain unpaid for years ; other revenues earmarked for the service of some particular foreign loan can be diverted ; illegal taxes may be imposed ; cargoes can be seized ; trade boycotts can be applied to wage secret warfare against the "enemy" of the moment ; and the world will applaud these evidences of China's rejuvenation.

But ; let one cent of the sacrosant Chinese Maritime Customs revenues be diverted from the service of the foreign loans secured thereon ; let any rebel war-lord even suggest that he be conceded the right to enjoy the revenues of the territory under his control, and the picture changes. The cumbersome, slow-moving machinery of diplomacy begins to squeak. Protests clog the wires and mails ; the doings and sayings of Ministers and Secretaries become front page news ; questions are asked in Parliament and answers skillfully evaded ; war-ships move to the scene of the outrage ; press correspondents hasten to be on the spot where hell will break loose next ; the stage is prepared for action ; the world waits for the storm to break, and then—nothing happens.

Under the old order, joint diplomatic pressure backed up, if necessary by a show of force, would have sufficed to induce the Chinese to respect their agreements, but during the crisis of 1927, the American Government refused to co-operate with other nations in the protection of foreign lives and properties. The rendition of Hankow, the panic-stricken appeals of the pacifist and uplift element to surrender to the demands of the Nationalists, the subsequent recognition of their government and the opening of negotiations for revision of the treaties, have had their effect.

The events of the past few years have taught the Chinese that force will never again be employed to exact reparations for outrages against foreigners. China is now a sovereign state, on a plane of full equality with the other great Powers, enjoying a seat on the League Council, and the World Court, where all these troublesome questions can be adjudicated by international lawyers when their settlement can no longer be staved off by diplomacy. China may not possess a navy, but she maintains the mightiest armies in the world. The Chinese war-lords are more puissant than any of the generals who commanded the armies that fought the World War. China resounds to the tramp and clash of contending armies. The war-lords no longer fear armed international intervention, the imposition of sanctions or ultimatums backed up by force. Those days are past. To the mind of the Asiatic, all this constitutes a recognition by the West of China's strength and superior military prowess.

Foreign war-ships that once represented the might and honor of the nation whose flags flew from their mastheads, are now fired on with impunity by the bandits and rabble armies who garrison and line the banks of China's navigable rivers. To snipe a few foreign bluejackets has become the favorite inland sport of communist, bandit and free lance leaders. The killing of Jackies to make a Chinese holiday and provide entertainment for swashbuckling heroes of the native countryside, fails to excite public indignation in their homelands.

The popular fighting general of the "Devil Dogs" of the American Navy, whose name has inspired fear and respect in all other parts of the world where they have fought, returned home after two years in China and boasted in the newspapers how he commanded an army that fought a war without firing a shot. He even revealed how he planned to have the cash ready to buy the entire Chinese army near Tientsin, if it threatened hostilities. Is it any wonder that Chinese militarists have so little fear of a nation whose famous fighting general publicly acknowledges the superiority of their conception of the art of war ? Perhaps Pu Te-ler Chung-chiang was telling the truth. Native vessels pay for protection against bandits in China ; why should not these little river gunboats also render tribute ? If the bandits and communists keep firing on them and killing their sailors, may be some nice American Admiral will follow Pu Te-ler's tactics and procure the cash to buy them off with—Maybe! The native mind works that way.

Some day, however, one of the foreign Admirals of the Pacific Fleet or the Yangtze Patrol, or a Minister or Consul-General making his tour of inspection on a gunboat flying the flag of the nation he represents, will be potted by these roving patriot bands, and something will really have to be done about it. If the past is any criterion for the future, the Government concerned will accept the profuse apologies of Nanking, Peking, Canton or Mukden, as the case may be, pass a resolution of sympathy for the family of the dead official and let the incident pass.

After all, these foreign gunboats and pesky river steamers that deprive the Chinese junkmen of a monopoly of the carrying trade, are violating the sovereignty of China, exercising their rights to inland water navigation by force. Foreigners overlook that extraterritoriality ceased on January 1st, a date that will go down in history as the Fourth of July of the great Oriental Republic. Nanking may be engaged in a war to preserve its authority ; the Feng-Yen combination may occupy the attention of the Nationalist military chieftains, but the Kuomintang statesman do not forget for a single moment that that their main fight is directed against the foreigner. So we have the picture of a government battling for its very life with internal enemies, carrying on diplomatic negotiations with the Powers for the surrender of their treaty rights. And although the rule of Nanking is limited to very definite districts in three coastal provinces ; the Powers have expressed their willingness to hand over their nationals to its jurisdiction and protection !

There will be no foreign intervention in China. China will proceed in her own superior way disregarding the rights of humanity and utterly oblivious to her obligations to the rest of the world. Nanking will win the war by hook, crook, compromise or the help of Mukden. But China will never disarm. New armies will be raised to suppress banditry and stem the rising tide of communism. Huge garrisons will be necessary to impose the rule of Nanking on the rest of China. The arsenals of the country, larger and better equipped than many pre-war Occidental establishments, will be extended and improved with the latest machinery for turning out munitions. Aeroplanes, bombers, poison gas, machine guns, quick-firing artillery, tanks, armored cars, automatics, bullet-proof vests and all the modern paraphernalia of mechanical death will continue to be imported. A navy will be created. Fast cruisers, gun-boats, destroyers, submarines, aeroplane carriers and even a few battleships will be built. Civil wars, brigandage, piracy, communism, revolts, pillage, massacre, famine, starvation, destitution and death will continue to be lot of the unfortunate dwellers in the Flowery Republic. There will be no cessation from these evils until some strong government succeeds in establishing its rule over the entire country.

Even if Nanking emerges victorious in the present conflict, it must face the greater task of restoring law and order, of reasserting its authority over whole provinces south of the Yangtze that have come under communist influence. The fight against banditry and communism will tax its energies and drain its treasury of funds urgently required for rehabilitation and constructive measures. Unaided, Nanking will never be able to cope with a movement that has gained such an impetus, that the Soviet Committee at Khavarovsk recently cancelled an appropriation of Five Million Dollars for missionary propaganda in the territory assigned to its activities. Why should Moscow waste good money when the spread of communism in the Yangtze Valley and South China is creating another 50,000,000 good Bolsheviks to push the cause along? China is as much an instrument of Moscow, as though she was already an integral part of the Soviet system of Socialist Republic. No matter which side in the present civil war in China emerges as the nominal victor ; it loses. The real victor is Moscow. Yet with this outlook before us, the Great and Wise Minds who direct the diplomacy of the Powers are nonchalantly discussing with Nanking the recognition of its right to exercise jurisdiction over their citizens ! Extraterritoriality will go ; the Concessions will follow ; Shanghai will be surrendered ; there will be nothing left. China will be mistress in her own house. Why should foreigners in China become hysterical over the impending surrender ? After swallowing a string of double-humped camels, why strain over the little Custom's gnat !—G. B. R.

Poor Shensi!

While Millions of Human Beings are Dying of Starvation in the Cradle of the Chinese Race, a "Christian" Hero and a "Model" Governor Block the way to Succor!

THE article on "The Satochow Irrigation Project" written by Mr. John Davis, an American engineer working under Major O. J. Todd in the construction of the project, brings up to date a similar article published in the November 1929 Number of the *Journal of the Association of Chinese and American Engineers*. Mr. Davis enlightens us by first hand testimony, why the American Red Cross could not ask the American people to contribute a great relief fund to succor the starving millions of Northwest China. In Saratsi, after agreeing to provide protection to the C.I.F.R.C. engineers and workers, the Provincial Government failed miserably to live up to its contract. The Commission has been forced to engage its own guards for protection against the bandit gangs who terrorize the countryside. The staff sleep with rifles and revolvers prepared to defend their lives against surprise night attacks and during the day carry forward their work under the vigilance of guards posted on the roofs of the buildings to watch for the approach of bandits.

If this is the situation in the Province of Suiyuan, served by a railway from Peking and under the direct rule of Marshal Yen Shih-shan, the "Model Governor," what must be the conditions in Shensi, far beyond the railhead of the Lung-Hai or Peking-Suiyuan lines. If a small group of relief workers are not safe from the attacks of bandits in Suiyuan, what would befall the hundreds of American Red Cross workers engaged in carrying relief to the starving people of Shensi? The complete breakdown of law and order in China and the inability of its rulers to discharge their most rudimentary functions, is responsible for the failure of the American Red Cross to undertake a task that can be carried to a successful termination only with a bowl of rice in one hand and a gun in the other. The experience of the C.I.F.R.C. in Suiyuan is sufficient proof that the Chinese authorities cannot or will not provide this protection and that the grain contributed by the American people to save the starving would feed the soldiers or bandits responsible for the catastrophe. The American Government cannot ask its official relief organization to risk the lives of its staff and workers in a country whose government is not only powerless to protect them, but too proud to admit the truth; even to save the lives of its people. Two millions of peaceful Chinese have died in the past two years in order to satisfy the ambition of a Christian War-Lord, the Hero of the Missionaries! Another million will perish miserably this winter because this "Paladin of Righteousness" and his Political Ally, the "Model Governor" of Shansi, hold the railways, the highways, byeways and other means of communications with the famine stricken regions. These railways, with their rolling stock, motor buses, automobiles and other transportation urgently needed to rush aid to these starving people cannot be released for humanitarian purposes. The fate of Feng and Yen depend upon their ability to hold these sources of revenue and avenues of retreat. As far as Feng is concerned, Shensi has been sucked dry. It has no further value to an army that must find fresh territory to live upon. The province of Shensi has served its purpose and its people that are left alive must be sacrificed to the needs of the War-Lord and his hosts. Here is one of the main causes underlying the present war. Kansu is starving. Two years or more supporting Feng's armies, completed the utter ruination of this province. Three years of Feng's rule in Shensi has transformed this once fairly prosperous province into a vast graveyard. Feng's armies cannot retreat into the devastated Northwest; they must fight to break out of this corner, or starve with the people they have ravaged and ruined. This explains the present civil war, and if Feng wins, in another two years, Shantung, Honan and North Hunan will be despoiled, impoverished and their people brought to the verge of starvation.

Nanking may be as corrupt and inefficient as the propagandists of the Feng-Yen combination make it out to be; but it cannot fairly be held responsible for conditions that have condemned millions of defenseless peasants in the Northwest to a lingering death and sold their young women into lives of hopeless bondage and degradation. Nanking may have raised enormous loans since Chiang Kai-shek assumed command of the Nationalist armies, but if the disbursement of these funds is ever audited, it will be revealed that a fair proportion of the proceeds went to buy the allegiance of a brace of War-Lords whose other sources of revenues had been destroyed by their own rapaciousness.

We hold no brief for Nanking, but with all its shortcomings, it comes nearer to being a government worthy of respect than any other règime that has exercised power in China for the past fifteen years. It deserves support from all disinterested foreigners in order that a strong centralized government may be evolved out of the present chaos and save China from a prolongation of the horrors that have brought the country to ruin and its people to misery, degradation and death. Foreigners have their points of difference with Nanking, but in our opinion, the welfare of the millions upon millions of despairing human beings in China is of more importance than the immediate solution of the knotty problems involved in China's international relations. Nanking in due course, will deprive the foreigner of his few remaining extra-territorial privileges. That, however, is an affair that the governments concerned are quite competent to properly handle.

The propagandists of the Feng-Yen combination accuse the Nationalist leaders of being crooks, grafters, robbers and worse. The foreigner has no means of ascertaining the truth of these statements and even if they could be proved, it would leave us cold. The Northern Militarists had their chance to give China a strong efficient government and bring prosperity and security to the country. But they sold the birth rights of the people for a pittance; they floated and pocketed one foreign loan after another; they hypothecated every available asset of the nation; they issued unauthorized bonds secured on the Customs; they ordered millions of dollars of railway and other equipment and refused to pay for it; they imposed new taxes; flouted their treaty and loan obligations and squeezed, pressed, milked and sucked the people dry, to pay for their interminable wars over a division of the spoils. Their defeated leaders with their wives and concubines are enjoying their stolen millions in the safe precincts of Dairen, Beppu, and other places outside the reach of Nationalist retribution. Now that Feng and Yen—the last of the Peiyang Generals—have started another war, these harpies and vultures are preparing to return and sink their talons and beaks once more into the flesh of their helpless victims. The Nationalists may be as bad as they are painted by the North, but nothing they may do can begin to compare with the orgy of misrule and tyranny, wholesale peculation of public funds and supreme indifference to the rights of the people that characterized the rule of the Northern Militarists.

The Pot calls the Kettle black. The air is thick with the revilings of both sides, but behind all the thundering and vituperation of the North, stands the grim Shadow of Death; of millions of despairing human beings praying for deliverance from the fate that the grasping War-Lords of Shansi and Shensi have brought upon them. And these unfortunates are doomed to die because this combination of a "*Christina Hero*" and a "*Model Executive*" (God Save the mark!) dare not surrender the railways and motor trucks to carry food to their starving compatriots. The revenues that might be used to save the lives of the people whose labor and necessities make their collection possible, must be diverted to the maintenance of huge and useless armies and the prosecution of a senseless war that no matter which side wins, must bring added horrors and impose heavier burdens upon the broken backs of a people quivering under the lash of pitiless taskmasters.

It is impossible for any right minded observer to view the situation in China with feelings other than of deep sorrow and resentment against a system that dooms millions of people to death by starvation, typhus and disease. American charity would long ago have contributed the grain to relieve these farmers of Shensi if the necessary guarantees were forthcoming that the food would be permitted to reach the real sufferers. No such guarantee could

be given and the civil war now raging in the Yellow River regions makes still more difficult the passage of relief trains. No outside help can now reach Shensi.

Perhaps it is the duty of the American people through their official Red Cross organization to insist upon sending relief into Shensi, handing over the grain to the Northern Chinese authorities for distribution. Congress might have voted a great wheat fund of $25,000,000 to help our own farmers by buying up their surplus wheat in order to succor the starving in Shensi, but there were no guarantees that the wheat so dispatched to China would reach its destination. On the contrary there was every certainty that it would be seized to feed the armies and bandits of North China whose exactions, depredations and wholesale confiscation of food-stuffs is responsible not only for the famine but for the civil war forced upon Nanking by the armies of Feng seeking new feeding and foraging grounds and a more prosperous people to prey upon.

It is no concern of the foreigner what China does in her own house. No nation can intervene, even in the Name of Humanity, to save the people of any province from starvation and death, unless invited to do so. Foreigners can only look on and wonder that such things can be and, as far as possible, refrain from comment. But when the Chief Publicity Agent and spokesman of the Yen-Feng combination arraigns Americans as being responsible for the failure of the Red Cross to succor the starving millions of Shensi, it is high time that the truth concerning the causes leading up to this situation be as bluntly and forcibly stated.

Nanking cannot be held responsible for the conditions in a territory held as the preserve of its bitterest enemy, yet it continues to draw plans for the construction of huge highway and railway schemes, harbor and river improvements, city planning, public works and other undertakings calling for the expenditure of hundreds of millions of dollars, while foreigners interested solely in the material development of the country hail these gestures as signs of progress. But we are old-fashioned enough to hold that the first and highest duty of Nanking, of Peking, of Kaifengfu, of Canton, of Mukden, and other centers of Chinese authority, is to the people of Shensi, the oldest of the Eighteen Provinces, the birthplace of the Chinese nation. A truce based on the urgent necessity of rushing relief into the stricken province would do more to elevate China in the esteem of the world and assure outside sympathy and contributions than all the propaganda claptrap now disseminated by the official press champions of the contending factions.

Ten years ago, when the Japanese held the Province of Shantung, the Chinese wail of anguish over this desecration of the Holy Land of China, stirred the sympathy of the world. In the last ten years, the people of Shantung have emigrated *en masse* to Manchuria in order to escape the crushing tyranny of the militarist task-masters who took over the province when the Japanese withdrew. To-day thousands of the people of Shensi, the cradle of the Chinese race, are dying daily of starvation, and aside from an occasional missionary appeal that falls on deaf ears or the campaign of an unofficial relief organization trying to raise funds in the United States for their succor, not a voice is raised in their behalf.

Poor Shensi! It's people are forgotten; their cries for help drowned in the roar of crashing armies and the propaganda thunderings of rival war-lords.

G. B. R.

The Satochou Irrigation Project

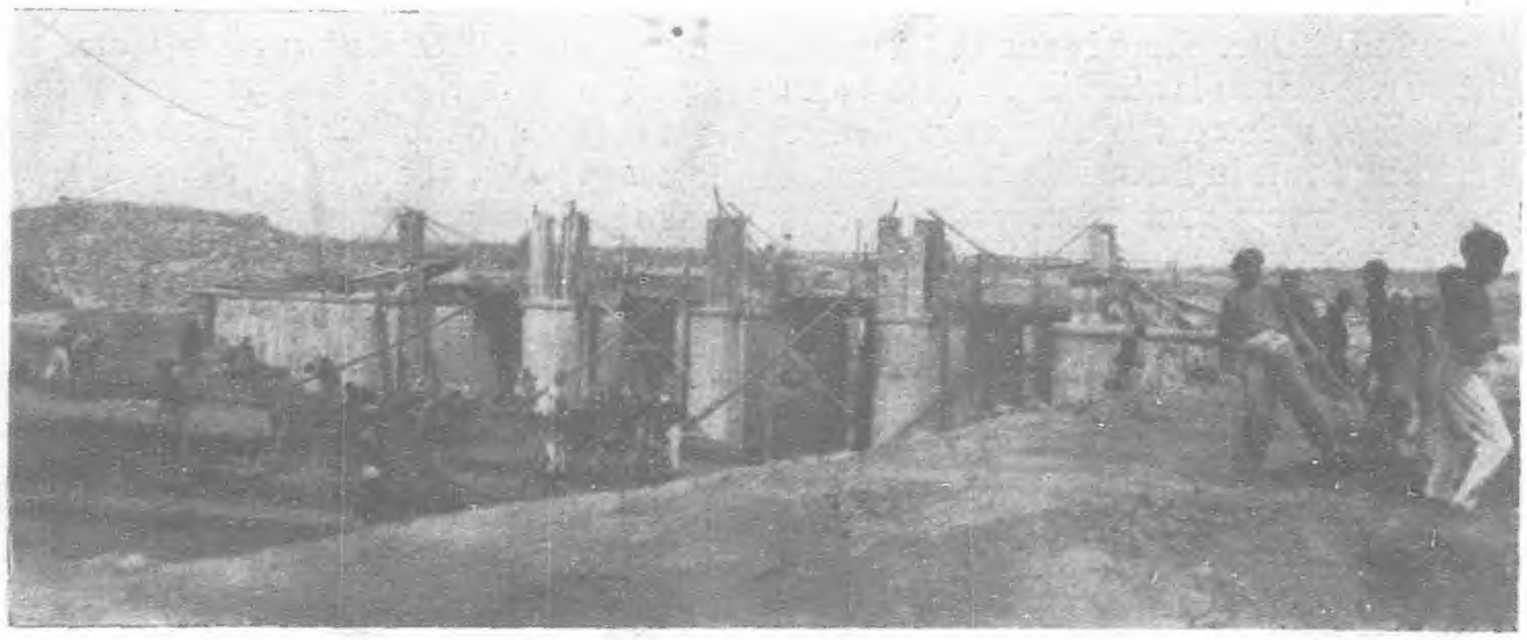
By JOHN DAVIES

THERE had been drought for two years in Suiyuan. Drought, of course, meant famine. And famine meant typhus, the dreaded famine fever. Driven desperate by the plight in which they found themselves, the people appealed to the provincial government to remedy the situation by means of irrigation. The provincial government invited Major O. J. Todd, chief engineer of the China International Famine Relief Commission, to make a preliminary survey of the district in order to determine the feasability of an irrigation system. Responding promptly, Major Todd went into Suiyuan in the spring of 1929, made his survey and reported that the territory could quite easily be irrigated. On June 1, 1929, a contract was signed whereby the China International Famine Relief Commission was to take complete charge of the construction and advance a loan of $350,000, which was to be repaid in water rates when the irrigation system was in operation, while the provincial government was to supply $200,000, arrange for right of ways and provide protection to the C.I.F.R.C. engineers and workers. Before the end of the month, Major Todd had arrived on the scene and taken over the work which had been started by the government. This, then, was the genesis of the Satochou Irrigation Project.

The area to be irrigated by the Project is approximately two million mow. It lies in Saratsishien, just south of the Peiping-Suiyuan railway line. The water for the system is taken from the Yellow River about a mile south of the hamlet of Tenkou, twenty miles from Paotou, the terminus of the Peiping-Suiyuan Railway. Running east from the intake, the main canal extends nearly 43 miles to the dried bed of the Black River. At right angles to the main canal are fourteen subsidiary canals, the laterals. The fourteenth lateral makes use of the Black River course, but cuts across the old meanders. All of the laterals lead from the main canal to the Yellow River, which, by flowing in a south-easterly direction, forms an acute angle with the main canal. The Satochou Project is a huge right triangle with the main canal and the fourteenth lateral as the two sides and the yellow River as the hypotenuse.

The river work is practically completed.... Three massive gates have been installed at the intake. Embankments have been built, for the country through which the Yellow River flows is flat, even here at the foot of the Mongolian plateau. And the river is capricious enough to change its course without warning. In digging the canals, several miles from the present course of the river, cross-bedded sand has been found indicating that recently the river had followed a quite different course from its present one. Hence the need for embankments at strategic points. A submerged wier is being laid about 200 yards downstream from the intake. Major Todd estimates that this wier will raise the water level in the main canal two feet. This will insure an adequate supply of water in the canals. To build this wier, two towers have been constructed, one on either bank of the Yellow River. Between these towers a cable is strung, attached to which are the stone barges used in the building of the wier. The rock for both the embankments and the wier is brought the two and a half miles from the Commission's quarry by a baby railway laid down by the C.I.F.R.C. engineers in 1929.

Work on the canals is not as far advanced as that at the headworks. With the control gates installed at the intake, water may be let into the main canal, barges brought in from the Yellow River and construction of the laterals appreciably speeded up. Major Todd estimates that the main canal and the first eight or ten laterals should be completed by October of this year. From the laterals water will be pumped up to the farms by means of ladder or dragon pumps, familiar sights in the Yangtze Valley and south China countryside. These treadle pumps are an innovation in Suiyuan,



The Headworks at the Intake

the people there having never seen them. Major Todd is having pumps of this style used now for draining swampy or flooded sections of the canal. He finds them far cheaper and more efficient than the old method of two men swinging water out by means of a woven basket between them. American and European machine pumps have proven unsatisfactory in a large measure.

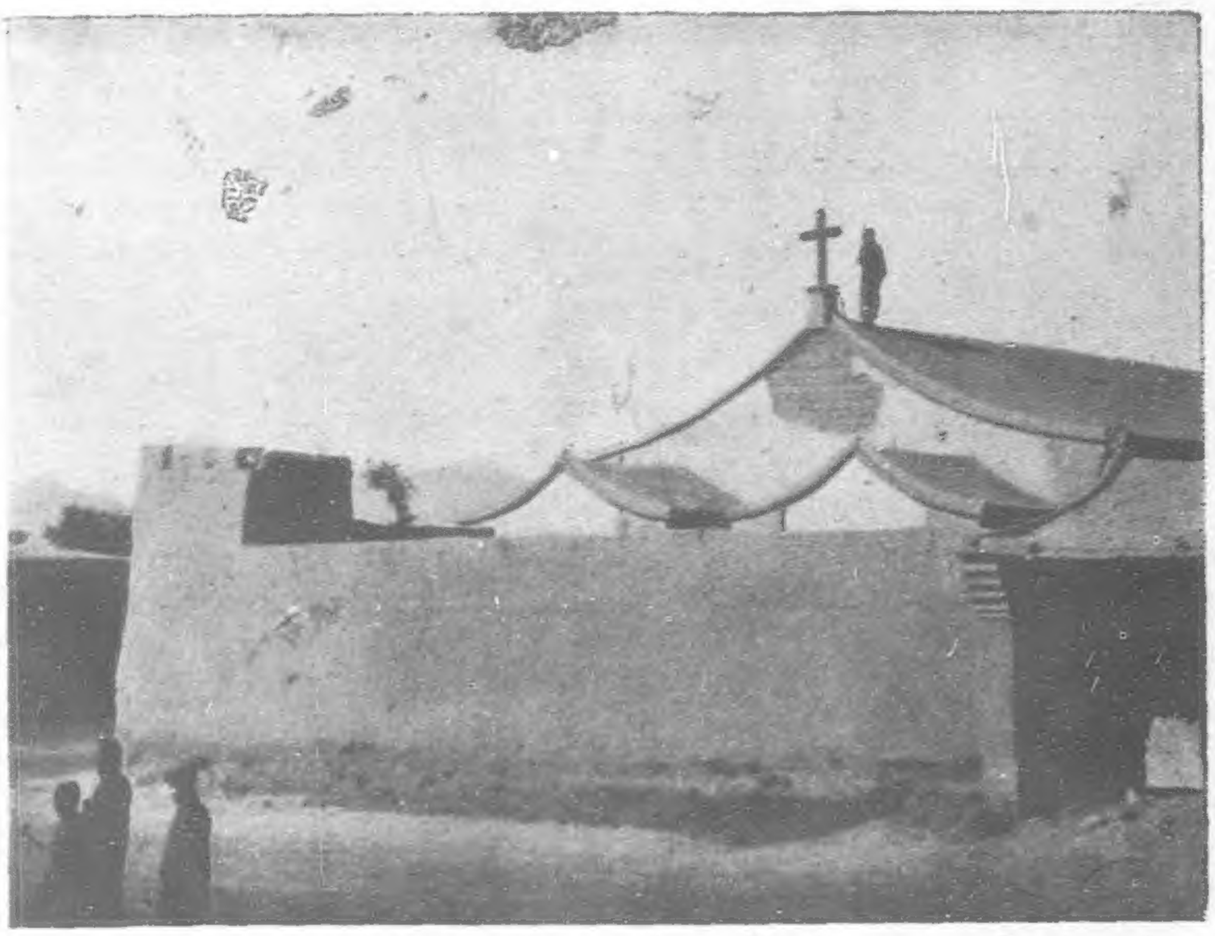
There are two main camps, one at Saratsi, the headquarters, and the other at the intake. There are subsidiary camps and engineering offices along the course of the main canal. The camps at Saratsi and the intake are walled and parapeted. The Commission has its own guards, the provincial government having failed to supply the promised protection. These guards are stationed at all the camps and offices of the C.I.F.R.C. Guards accompany the Commission trucks whenever they venture out from Saratsi or the intake. Last year a party encountered bandits a mile or so south of Saratsi. The brigands succeeded in shooting some pretty holes in the truck, but fortunately none of the engineers were hurt. The chauffeur escaped by jumping into the adjacent ditch and rolling in the mud. It was well that he did so, for there is a neat bullet hole in the back of the driver's seat. The noble guards on duty at the headquarter's camp neglected to come to the rescue, being busily engaged sipping tea in a Saratsi boulevard cafe. The engineers fought out the battle themselves, routed the bandits and went on their way. At the intake, the engineers sleep with rifles and revolvers under their cots, for the bandits are across the river in the Ordos and one never can tell when they may sally forth to attack the countryside.

Last year the staff was considerably larger than it is this year. Major Todd, who is still the engineer in charge, feels that he is operating more effectively this year with a smaller staff. He is assisted by two foreign engineers, Mr. Eliassen, formerly of the Haiho Conservancy, and Mr. Sam Dean, a Presbyterian missionary and principal of an engineering school in Peking. Mr. Eliassen is a Norwegian engineer who received his training at the University of Minnesota. He is the only foreigner paid from the Satochou funds, inasmuch as Major Todd is directing the Project as the China International Famine Relief Commission's chief engineer and Mr. Dean is lent by the Presbyterian Mission, as Mr. and Mrs. Wampler, the business managers, are lent by the Brethren Mission. In 1929 the foreign staff was more than double what it is this year. The number of Chinese engineers is about the same. Last year there were 9,000 laborers recruited. This year the number of laborers fluctuates between 4,000 and 5,000. The greater part of these workers come from the districts in and around the Project. However, there are men who are recruited from as far as Kalgan. Those digging the canals are paid in grain, corn and millet, according to the number of fong they excavate. If they wish, they may be paid in cash instead of in grain.

When harvest time comes around many of the laborers leave their work on the Project to return to the fields. Although this slows up construction, Major Todd is quite satisfied that it should be so. The Satochou Project is not trying to take the farmers away from their crops. And so the number of workers on the canals fluctuates with the season. In July a great number laid off to harvest, and the construction of ditches slowed down temporarily. One can readily appreciate the struggles through which Major Todd has to go. This uncertainty of labor is but one of the many difficulties that constantly confront the engineer in charge of the Project. But Major Todd, with his characteristic energy and determination, is driving construction to a finish despite the extraordinary difficulties under which he is working.

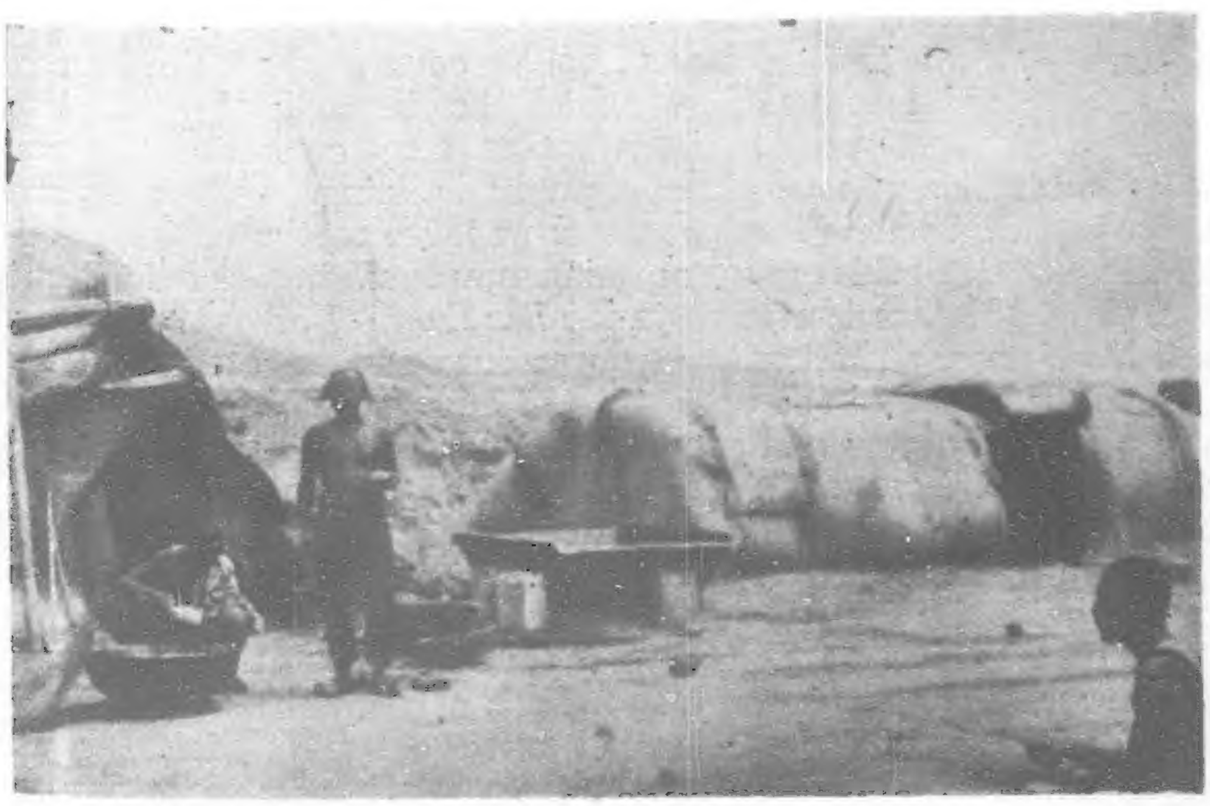
Once completed, the Project will be operated by the China International Famine Relief Commission until the money that the C.I.F.R.C. put into the construction of the irrigation system is returned through water rates. Then complete control of the Satochou Project

(Continued on page 343).

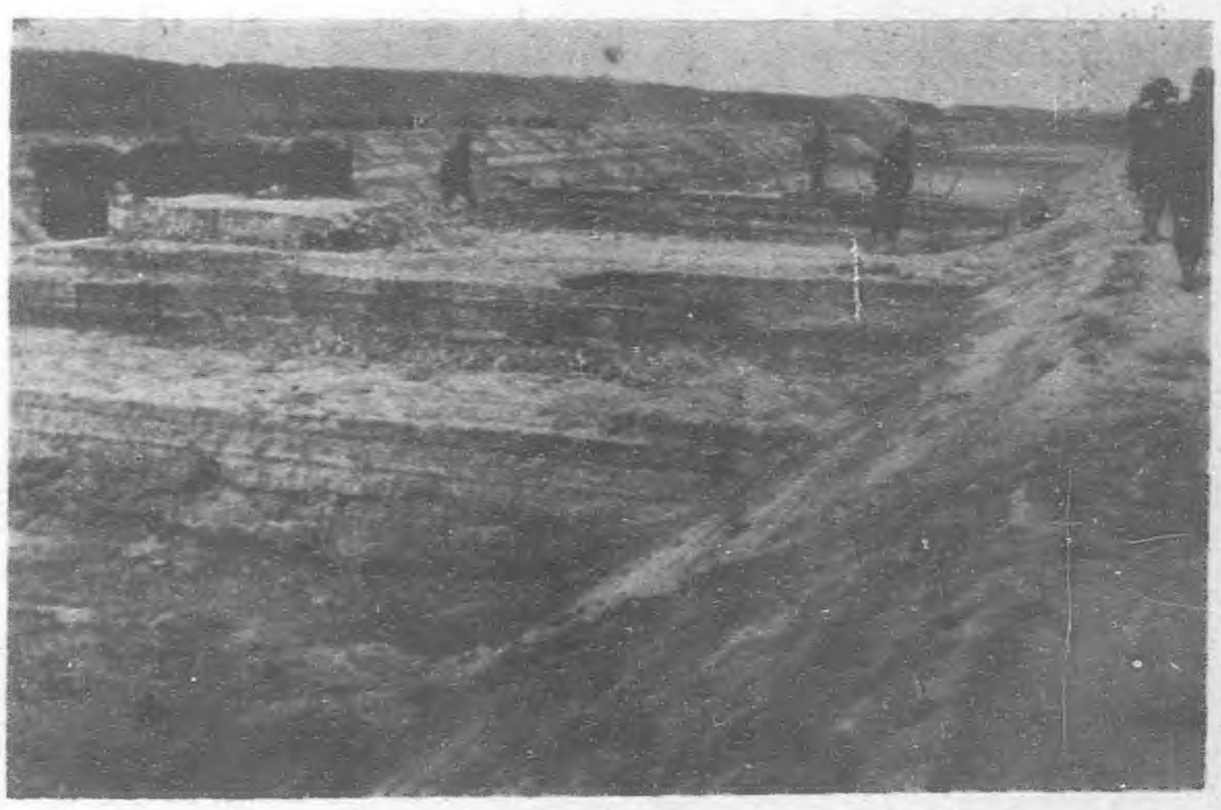


An Abandoned Catholic Church Now Used as An Engineer's Office. Note the Guard on Duty on the Roof: Looking for Bandits

One of the Laterals, Looking Toward the Main Canal



Workers Camp at the Intake



The Main Canal Under Construction

Japan Plans Semi-Official Telephone Company

At a time when China is embarking upon a program of government ownership of public utilities and exercising her powers of sovereignty to obstruct and illegalize the sale of the Shanghai Mutual Telephone Company's plant and business to the I.T. & T., Japan is breaking with her old ideas of official monopolies and adopting the American practice of separating business from government. Other governments operate their own communications systems, but it has been left to progressive Japan to enjoy the distinction of running one of the worst telephone services in the world. The mechanical equipment and technical end of the system has always been of the best, but it has cost in the past as high as Yen 2,000 to procure a telephone license and have the instrument installed. Sometimes, the subscriber must wait a year or more before he can get the service he is willing to pay for. Under such a system of government control, the business of telephone brokerage has grown to such proportions where it is estimated that nearly Yen 100,000,000 has been advanced by the banks on the security of privately owned telephone instruments.

The Japanese Cabinet recently approved tentative plans proposed by Mr. Koizumi, the Minister of Communications, to form a semi-government organization with a capital of Yen 800,000,000, of which half will be subscribed by the public while the State estimates that its present equipment and business is worth the other half of the amount. The main features of the plan are as follows :

1. Jurisdiction and administration of telephones to rest with the Government as heretofore.

2. A semi-government concern, empowered to build, extend and maintain telephones to be established, the shares of which the Government shall be the custodian. Thus the Government will control this public utility and utilize the people's finances, so that the public shall eventually be the gainer.

3. The shares of the semi-government concern to be widely subscribed for by the general public, so that public ownership of this utility may be brought home to the minds of the people.

4. Without drawing on the national treasury, the extension of telephone lines shall be accelerated, with the view to placing telephones within the reach of all.

5. It shall be made compulsory for the semi-government corporation to install so many thousands of telephones every year. The applications for telephones filed with the Government shall be taken over by the concern.

6. The business of telephones—contracts and collections—to be handled by the Communications Bureau.

7. The dividends on the Government's shares and the business profit taxes to be levied on the new concern will equal the present telephone revenue of Y.53.000,000 to the national treasury. The subsequent steady increase of telephone users will enable the concern to net an 8 per cent. margin of profit.

The aim of the new project apparently is to let the public contribute part of the funds and share in the promotion of the telephone service. No further burden will be put on the national treasury, but with the capital subscribed by the public, installation of new telephones will be made quickly. Due steps will be taken to check undue falls in the prices of telephones on the market.

Through the project, the Communications Minister intends to make it easier for the public to have new telephones. Because the plan is very extensive, involving disposal of State property, it concerns not only the Communications Ministry but the Government as a whole. A bill has to be introduced to the Diet for sanction before the proposed semi-official corporation is established.

There are divergent opinions as to the exact value of the present Government property. Some say that it is worth Y.200,000,000 and others value it as high as Y.600,000,000. There is a total of 760,000 telephones throughout the country, and since the average market value is Y.700, the telephones in the country amount to Y.530,000,000 in estimated value.

It is also pointed out that since two-thirds of the total number are owned by the middle class and are mortgaged, these owners will be hard hit when prices of telephones decrease.

W. Cameron Forbes

The New American Ambassador to Japan

Once again, a Governor General of the Philippines goes to Tokyo as American Ambassador. When, after the Russo-Japanese War, the Tokyo post was raised to an embassy and the Japanese Government nominated Viscount Aoki as its first Ambassador to Washington, it expressed the hope that President Roosevelt would send them a representative of equal rank and prestige. Viscount Aoki had held the portfolio of Foreign Affairs and the Governor Generalship of Formosa, at that time the most important office in the gift of his Emperor. To find an American who measured up to the Japanese conception of equality with Aoki was not an easy task. America had millionaires, statesmen and politicians galore who ordinarily would have been acceptable in any ambassadorial capacity, but Roosevelt had to find someone who ranked or outranked the Japanese nominee. Roosevelt and Taft put their heads together and solved the problem by selecting General Luke E. Wright, Governor General of the Philippines, at that moment in Washington on matters connected with the Philippine tariff. Wright made the sacrifice of his political ambitions and accepted the job. The Japanese were delighted.

Once more, when the post seemed to have gone begging, President Hoover has revived its importance by inducing the Honorable W. Cameron Forbes, ex Governor General of the Philippines, to accept the appointment. Both Japan and the United States are to be congratulated on the selection of a man so eminently qualified to interpret American policies and ideals as the one who as Governor General of the Philippines for four years, carried through the program of his predecessors to the point where the Philippines were on the highroad to prosperity, when Wilson undid the work of years by appointing Harrison to succeed Forbes.

Forbes came to the Islands from his counting house in Boston, with large constructive ideas, which he immediately put into practice. The expansion of Philippine commerce, its resources, the construction of its highways, public buildings, port works and other essential public improvements was due to the untiring self-effacing efforts of this quiet Bostonian man of affairs whose forebears had pioneered American trade in the Far East. Forbes turned over to his successor at Malcanan a prosperous and contented American dependency. Within seven years, the Islands were brought to the verge of bankruptcy and one of Harding's first official acts was to send General Leonard Wood and Mr. Forbes to the Islands to investigate and report on conditions. The Wood-Forbes report drawn up as a result of this sweeping investigation, still stands as the guide for American policy towards the Philippines.

Forbes comes to Tokyo at a time when relations between Japan and America are on a firm basis of mutual understanding. There are no points of friction between the two countries except perhaps the repressed resentment on the part of the Japanese towards our exclusion laws, a feeling that will disappear when Congress

revises the Immigration Law and places the Japanese on equal footing with other nations by admitting them on a quota basis. Japan and America are co-operating harmoniously in China. Japan is the best customer for American goods in Asia and is selling indirectly more American products in China than our direct exportations.

Forbes with his well trained business mind and intimate knowledge of Far Eastern political and economic problems will be a great asset to both America and Japan in his new post.

Hon. W. Cameron Forbes

His selection is also indicative of the close understanding between Washington and Tokyo in regard to China. For several years, Mr. Forbes has presided over the China Society of America rendering weighty assistance to the cause of China in the United States. His acceptance of the post is an assurance that the United States and Japan will continue to co-operate harmoniously for the solution of Chinese problems.

Nicholas Roosevelt

American Policies in the Pacific Strengthened by Hoover's Appointments

PRESIDENT Hoover may at times select misfits to fill Federal political jobs, but he measures up to the fundamental requirements of a great executive when it comes to selecting men to represent him abroad. Hoover's efficiency as an administrator is due largely to his ability to pick competent lieutenants to carry forward his policies and holding them responsible for results. The opportune appointment of the Hon. W. Cameron Forbes as the President's personal representative to the Court of the Mikado, is supplemented by the equally fortunate selection of Mr. Nicholas Roosevelt for the post of Vice-Governor of the Philippines.

Mr. Roosevelt comes to the Far East with a knowledge of its problems unequalled by any contemporary American. As editorial writer for *The New York Times*, Mr. Roosevelt has displayed such a profound appreciation of the forces at work in the Far East, that he stands to-day as one of the foremost authorities on the problems of the Pacific. America's future in the Far East, depends largely upon what we intend to do with the Philippines. America is now the foremost Power in the Pacific, irretrievably involved in the politics of Eastern Asia. The future greatness and prosperity of the nation is bound up in how we approach these problems.

As Mr. Roosevelt, so forcibly pointed out in his book, "*The Restless Pacific*;" "America's relation with the Philippines is an essential part of her policy in the Pacific. The problem cannot be separated from the rest of Asia and be regarded as a domestic issue concerning only ourselves and the Filipinos, for the reason that negative action is certain to have far reaching consequences. It is intimately connected with all our interests in the Pacific—with religion, commerce, and naval strategy, with our international ambitions and our altruistic ideals. Our prestige will rise or fall according to our conduct in the Philippines, and with our prestige will rise or fall our influence in the East. America's interests in the Pacific are thus intricately interlaced. If our idealism is to be made practical, it must be supported by a consistent policy in which right will rest on fact rather than theory, and, if challenged, will be supported by might."

America's future in China is indissoluably linked with the future disposition of the Philippines and *vice versa*. America's withdrawal from the Islands will convert them into a Chinese economic colony or throw them under the influence of Japan or Great Britain. The Philippines stand to-day as The Keys of Empire, the possession of which would give to any great Power the dominance of Asia. As long as they remain under American rule, their neutrality is assured, a guarantee that the *status quo* will be maintained. For the United States to withdraw its protection and leave the Islands to their fate, would, within a very short space of time, transform the political map of Asia and eliminate America as a factor in the only part of the world where we can hope to expand our markets and influence.

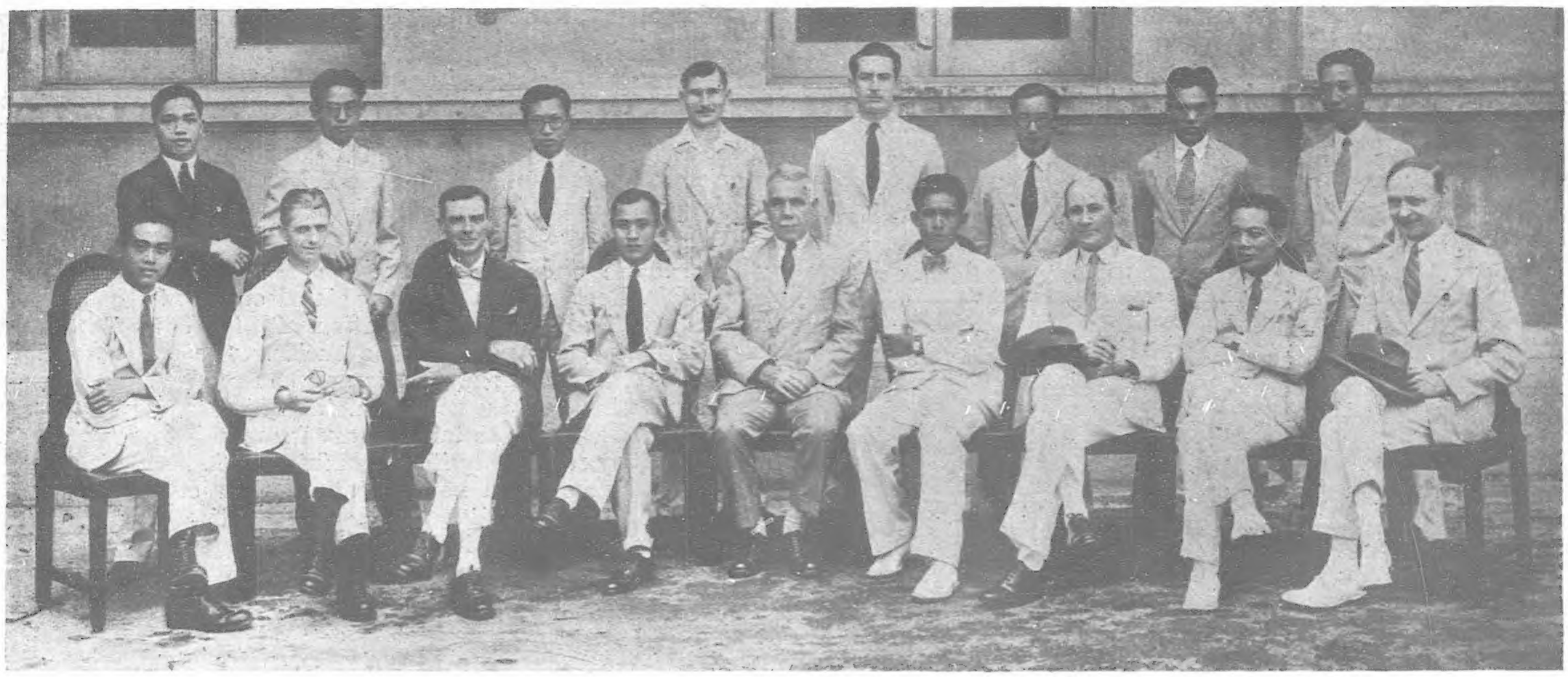
The Far Eastern Review hails the appointment of Mr. Roosevelt as Vice-Governor of the Philippines as a well merited recognition of his great worth to the nation as an expert on these problems. With Forbes at Tokyo, Davis at Manila with Roosevelt as his right-hand man and Johnson in China, carrying out the policies of a President and Secretary of State familiar with Chinese and Insular problems, supported by a group of experts in the State, War, Navy and Commerce Departments, American interests in the Far East are for the first time in our history assured of intelligent and appreciative attention.

Thé Satochou Irrigation Project

(Continued from page 341).

will pass into the hands of the provincial government. Major Todd estimates that land within the Project will in ten years be selling for ten times its present price. This same area which now supports less than 50,000 people is capable of giving a living to a population of half a million,—providing, of course, that the irrigation system is properly kept up and developed.

The work that the China International Famine Relief Commission is doing in connection with the Satochou Project is worthy of the highest praise. The famine sufferer is given a chance to help himself, to have work that will support him; he is not subjected to charity. The man can, to a large degree, maintain his self-respect. What is more important, the work of the Satochou Project is preventitive. In Suiyuan the Famine Relief is putting into practise the policy of preventing famine, which is a far sounder procedure than doling out temporary relief. It remains to be seen what the Suiyuan Provincial Government will do with the project when it is turned over to them some years hence.



Engineering Society Committee 1930 of the University of Hong Kong: President, Prof. C. A. Middleton Smith, M. Sc. M. I. Mech. E.

"Practical Chinese Engineers"

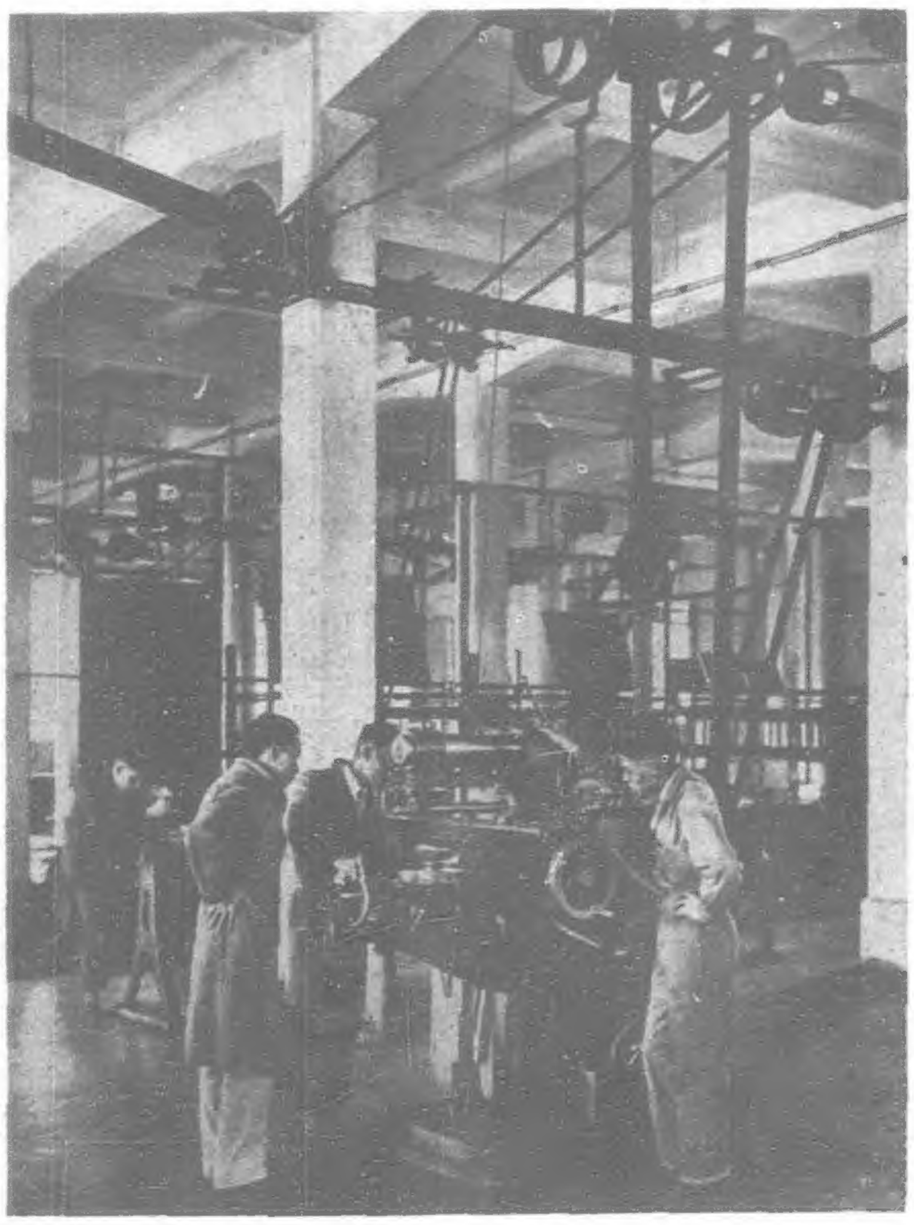
The Demand and the Supply

By C. A. MIDDLETON SMITH, M. Sc., M. I. Mech. E., Taikoo Professor of Engineering in the University of Hong Kong

FROM time to time commercial firms in the Far East communicate with the authorities in the University of Hong Kong on the subject of Chinese engineering graduates. There are a large number of these graduates who have obtained degrees in America, Europe or the Far East. Many of them are doing useful work in China. Some of those who have obtained engineering degrees have not practised as engineers but have become school-masters, etc. Chinese technical graduates have been subjected to severe criticism. Since the readers of this journal are particularly interested in Applied Science work it may be useful to discuss whether the Chinese University graduate in Engineering has failed ; and if so, why ?

A typical criticism received, which had especial reference to the work done in the engineering departments of the University of Hong Kong, is the following. A British firm with great experience of business in the Far East expressed disappointment that the University has not supplied China with "practical Chinese engineers." As other firms and engineers in the Far East have the same ideas, it may be as well to discuss, in detail, the complaint that is so often made. It is that Chinese Engineers, with University degrees, are not sufficiently practical.

A not uncommon statement made by the critics is that an engineer must, to be of any use, no matter what his social status, go through the shops in addition to his University course. "Theoretical and school education, no matter how good, is by itself useless." That view is, of course, generally accepted by the British technical societies (*i.e.* Institutions of Civil Engineers, Mechanical Engineers, Electrical Engineers, etc.). It is made a condition of membership of these Institutions that the candidates must have had a period of practical experience. It is, however, as well to record the fact that the candidate, nowadays, must also possess a University Degree or he must pass an examination in the theory of his particular branch of engineering science.



Students at Work on Milling Machine

China's Educated Classes

Another complaint that is often made is that the Chinese educated classes will not do manual work. Reference to the contempt for such work, as visibly expressed by the abnormal finger nails of the old days, is frequent. But the Chinese youth of to-day who comes to the University of Hong Kong, has, on the average, no more contempt for manual work than the average British boy. One of the most amazing changes of the past twenty years is that of the outlook on life of the Chinesee youth of both sexes. It is true that there is a great difference between British and Chinese boys in the characteristic that may be called "mechanical instinct." That is hardly surprising, because the British boy is brought up in surroundings that impress ideas about things mechanical upon his young mind from the earliest days. The average Chinese child does not ride in railway trains, use electric lifts, see aeroplanes, use wireless, travel by tube or stand on moving staircases. He usually does very little science at school.

University of Hong Kong: Ho Tung Workshops

Students at the Bevels

Instruction in Lathe Work

He spends a great deal of time studying Chinese language and literature and must learn English to a fairly high standard. His environment and studies during his school days are entirely different to those of the British boy.

Experience Teaches

The employers of engineers are, not infrequently, men who have had no technical training. A number of well-meaning specialists on education, who also have had no technical training, discuss the subject of technical education with a confidence that is as unexpected as it is dogmatic. They do not dictate to doctors about the details of medical courses, but they do state what should, and what should not, be done to train engineers. It requires a considerable gift of patience to reply in a gentle manner to such critics.

During the last forty years the subject of training all grades of engineers has been constantly under discussion in the technical press and at meetings of technical societies. As a result there has been evolved in England, and in many other countries, a system of training which may be said to be almost standardized.

With certain minor modifications that system is as applicable to young Chinese as to young Britons, Americans or Germans.

To that system, in as far as it applies to the training of young Chinese engineers for commercial and executive work, the Board of Faculty of Engineering of the Hong Kong University has adhered as far as the available facilities have allowed. It can be improved by further co-operation of manufacturers and engineers in practice who wish to see the natural resources of China developed. The main ideas of the system have been gradually evolved as the result of many years of experience in all parts of the world. The minor modifications which have been made in Hong Kong have been the result of observations concerning conditions in the Far East.

Chinese Workmen

It is unfortunate that by many people the word "engineer" is applied to anyone who has anything to do with the technical side of engineering work. It is used to describe a man with a professional training as expensive and as lengthy as that of a doctor or a man of law. It is also used when speaking of artisans. It is, however, obvious that the training needed to produce the expert on designing bridges, machinery, etc. is very different to that needed to produce a good manual worker or craftsman.

Europeans who are brought into contact with Chinese workmen quickly recognize certain characteristics that are admirable. They are usually industrious and, individually, they are inveriably good-tempered. They may seem to be a bit pig-headed and, once they have a way of doing a job, dislike change of method. They are, at times, inconveniently curious about mechanism, and almost absurdly confident of their ability to do jobs concerning which they have no knowledge. It is, however, the experience of the writer,

University of Hong Kong

Students in the Smithy

A Corner of the Ho Tung Workshops

after eighteen years of daily contact with Cantonese workmen, that they are very industrious, good tempered and most eager to learn anything that will help them in their work. We have, at times, experienced difficulties that have been often due to language misunderstandings.

At first the new comer to China is impressed by the guild or trade union system. As far as Hong Kong is concerned there is a society of Chinese artisans called the Chinese Engineer's Institute. During the political troubles of 1925 this Institute was of inestimable value to the local community. Its Committee refused to be stampeded by the communists. Although some individual members did go out, because of intimidation, the Committee, at great personal peril, worked hard to keep members to their duty to their employers. They succeeded. For that the community owes them a debt of gratitude.

The Committee have always interested themselves in educational matters. They seem to need advice as to the best method of expenditure. If not very efficient in educational work they are enthusiastic about it.

At this time of writing the Hong Kong Government has done practically nothing for the education of the artisan class, except, of course, the splendid facilities for school education that are provided for all Chinese boys in Hong Kong. There is nothing in the shape of trade schools in Hong Kong.

In the Taikoo Dockyard and, in the Hong Kong and Whampoa Dockyard, in the Royal Naval Dockyard and in the Hong Kong Electric Co's. works there is an apprenticeship system. For all practical purposes it is concerned only with craftmanship. The apprentices enter at an early age—about 15 years—and usually have no knowledge of the English language. These boys are trained to become workmen.

In other local works that are managed by Chinese there seems to be no apprenticeship system. There is thesm all boy—the "makee learn pidgin"—who often does a great deal of work while the craftsman looks on! On the whole the guilds, or trade unions, seem to have no control over work such as is common in Britain. A man may be a tinsmith one year and a furniture maker or a shipwright the next year. He applies his knowledge of one trade to the work of another, often with disastrous results.

The Two Classes

Two distinct types of youths can, and should, receive instruction in engineering subjects in Hong Kong. The two types are (A) Professional Engineers (and in this category are included those students who have been trained at the University of Hong Kong in (1) civil (2) mechanical and (3) electrical engineering) and (B) Workmen or artisans, (included in this category are foreman, charge hands etc. and for whom no special provision is made in this or any other British University). The University of Hong Kong was not founded to train class (B).

The types (A) and (B) are generally drawn from two distinct social grades. In England Class (A) are mostly from the Public Schools and class (B) from Board Schools. A very small proportion of clever youths in class (B) are able, in England, by a system of scholarships, to find promotion to class (A). In Hong Kong University there are donor and other scholarships which never have been, but which well might be, definitely allocated for the encouragement of clever youths in the social grade (B). These youths could then enter the University, if they are qualified to take advantage of a University education, by being suitably prepared to pass the Entrance Examination. They must go to some school, such as Queen's College, to be so prepared. It must require a very exceptional youth to pass the entrance examination unless he enters the University direct from school. We have adopted measures to encourage apprentices (in class B) but the number that could stand the strain of simultaneous manual labor by day and intensive study at night must be very small.

Works' Apprentices

Although, by the nature of our work, the Engineering staff of the University is primarily interested in class (A) we have always advocated that the local Government and employers of labor should interest themselves in technical education for all classes of the community. In this connection we have suggested and have arranged that class (B) should have, as far as is practical, the advantage of the technical equipment of the University and the experience in technical education of the Engineering staff of the University. We have also considered, in great detail, how to encourage youths from class (B) to enter the University; and, in addition to advocating scholarships, have persuaded the Senate to approve of a special Regulation on their behalf so as to make it easier for them, than for the ordinary youth, to have the advantage of a University training.

It was framed particularly to benefit and to give concessions to apprentices in the local dockyards. The Regulation reads as follows:—

> "Apprentices in Engineering indentured to approved firms will be admitted to the first year lectures in engineering at the University as external students, provided that they pass an entrance examination in English and Mathematics of matriculation standard. Such students will not be allowed to continue their studies in the Faculty of Engineering unless, at the conclusion of their first year they either (a) pass the University Matriculation or (b) are exempted by the University Matriculation Board, on the certificate of their examiners, that their attainments in Part I Intermediate Examination, so far as the requisite subjects are concerned, are of matriculation standard, provided that Chinese students admitted under the proposed arrangement should, subject to the usual conditions of exemption, be required to pass a test in Chinese before a degree is granted."

No student could follow lectures etc. in the University unless he has passed such test in English and Mathematics. The Board of Faculty of Engineering is not in favor of the last condition concerning Chinese, but the Senate insisted on this condition. Even if, as we hope, the University Senate can be, in time, persuaded to abolish this rule about Chinese language, we think that very few apprentices will be able to take advantage of the facilities offered unless they have a good working knowledge of English before they enter their apprenticeship. It will be years before the first candidates are ready to prove the value of this scheme.

University Engineers

With regard to the training of mechanical and electrical engineers in the University, we have gradually amended, as the result of experience, the original course. In these departments, we were greatly handicapped, especially in the early days of the University, by lack of floor space and equipment. We admit, also, the additional handicap of the environment of the Chinese boy while at school. In general, when he comes to us, he has but the slightest idea of anything technical or scientific. We have found, however, that since the Ho Tung Workshop was opened in 1925—in which first and second year students have courses of instruction in fitting and machine tools, and work with their hands and in overalls—that the students take much more easily to other practical work in the Engineering laboratories. That practical work includes the running and testing of gas, oil and steam engines and all types of electrical machinery.

Some Results

In view of the statements that have been made it is advisable to explain exactly what has been accomplished during the 17 years of work in the University. There are now 142 graduates (B. Sc. Eng.) of this University. Since not a year has passed without some of the Hong Kong graduates being awarded an Honors Degree by the Assessors of the London University, and being certified as of the same standard as the Honors (B. Sc. Eng.) graduates of the London University, it must be obvious that a high standard of instruction has been maintained.

The majority of the graduates have elected to specialize in Civil Engineering. We attribute this to the following reasons. (1) In an undeveloped country, such as China, the work of the civil engineer on railways, roads, etc., must precede that of the mechanical or electrical engineer, as indeed, it did elsewhere. (2) The graduates believe that in the Treaty Ports they are safer and have better prospects than in the interior. Also that they more readily obtain employment and better pay on structural work etc. than in industrial organizations. For example, local graduates in Hong Kong, have been responsible for a great deal of reinforced concrete work etc. which they do independently. In industrial establishments they

believe that they meet with prejudice from those (European engineers) directly above them. With the foremen, this is partly what the psychologists call "a complex" about losing their jobs. In some cases the "complex" is connected with the University Degree. The older generation of engineers—and they are in authority—had very little opportunity for a University training such as is now obtainable. The conditions in their youth were different; engineering development has been so rapid that the leading technical institutions recognize nowadays that more time than formerly must be spent on mental, rather than manual, training. That is why, in recent years, engineering societies etc., insist upon examinations as a qualification for membership.

It is advisable to stress this point because it is so natural for a successful engineer to believe that the training which he received some thirty or forty years ago, and to which he attributes his success, is the training most suitable for the youth of to-day. Surely the training must be modified to suit the new conditions of engineering work. The complaint has been made that the Hong Kong University fails to turn out "qualified practical engineers." No University claims to turn out "qualified practical engineers." That can only be done by close co-operation between the University and those who are in a position to offer to young engineers the facilities for obtaining experience under working conditions.

The University Workshops

In the four year's course at the University the student is instructed in the general principles which underlie all applied science work. To benefit in any way from that course he must have in the first year or two at the University, instruction in Physics, Chemistry, and Mathematics. During these first two years he has, also, a complete course of instruction in the University workshops, in machine drawing and in elementary engineering subjects. We find that the Ho Tung Workshop course and the courses in the laboratories equipped for experiments in Applied Mechanics, Strength of Materials, Gas and Oil Engines, Steam Engines and Turbines, Air Compressors, Refrigerating plant, Hydraulic turbines, Electrical Machinery of all types, etc., etc., are especially valuable to the Chinese student. In workshops and laboratories, he obtains in many cases, his first acquaintance with moving machinery. He works with his hands, uses overalls, and comes in contact with the workmen. In no case have we discovered that students show a dislike for this work. We have found, however, that students who cannnot reach the standards required in the first year, sometimes transfer to another Faculty. Some of those, obviously unsuited by temperament to become engineers, give up the struggle.

During the second year of his course the student becomes acquainted with the running and testing of gas, oil and steam engines, in addition to the experience in fitting, turning and machine shop practice. In the third year, he devotes all of his time to engineering work. Mechanical and electrical engineers do a great deal of laboratory work involving the running of engines, motors, etc. In the fourth year the student continues to carry the third year work to a more advanced stage. Full details of all these courses are given in the University Calendar which is published annually. We wish particularly to point out the recent amendments which appear in the Calendar for 1930 in connection with the fourth year course for mechanical engineers. Workshop practice and organization is now an examination subject.

If the student has to depend entirely on this University course for his engineering experience he is not a "qualified practical engineer." That is made quite clear by the University. His degree is that of a "Bachelor of Science in Engineering." It is purposely *not* called Bachelor of Engineering. We insist that, in addition to this University training, there must be further practical experience before the man is "a qualified practical engineer."

Practical Experience

The University Authorities wish for the co-operation of firms in this matter. The following scheme has been advocated for years and if it could be put into effect would be most valuable for furthering the objects mentioned above. Evidence, collected over many years, has convinced many of the large firms in England (*e.g.* Metropolitan Vickers, The British Thomson-Houston Co. etc.), that a University training, of the type now more or less standardized, is essential for men being trained for the higher positions. That evidence, studied carefully by employers and engineering Boards of the English Universities, has also made them generally to agree that the following system evolved in recent years, gives the best results. The student completes his University training up to the Degree standard. He then spends some two or three years as a student apprentice in a large manufacturing works. What is most important about the scheme is this. In the works, the course of the student—he is usually called there a "student apprentice"—is as carefully thought out and laid down for him as at the University. His progress is watched and at any time he can apply to a qualified individual in charge of him, for advice and assistance. He is paid a living wage and knows that unless his conduct and work are satisfactory he will be dismissed. Full details of the system is published by the firms. A perusal is recommended of the booklet "Apprentice Training" issued by the British Thomson-Houston Co., Ltd., of Rugby. The course for student apprentices, who must have had a complete technical training in a University, "provides an excellent general training which fully qualifies a technically trained student apprentice for engineering, commercial and executive positions in the Company's service."

There have been available no such facilities in the Far East in the past. It is true that our graduates have been permitted to enter certain local works, including Taikoo Dockyard, but in such cases it is inevitable that they are left to "pick up" for themselves whatever they can. It is essential to have some definite individual in the works responsible for their instruction and work.

Arrangements have recently been made so that selected Chinese graduates in civil engineering may enter the Public Works Departments of the Hong Kong Government as graduate-apprentices. They commence on a salary of $150 a month. It is believed that the practical experience which they will obtain will enable them to apply, to fuller advantage, the knowledge of the scientific principles of their work which they obtained in the University. It is hoped that the Shanghai Municipal Council and other similar bodies will make arrangements, on the same general terms, for graduate apprentices. Similar arrangements are needed for mechanical and electrical engineering graduates.

Works in England

It seems advisable, that, in addition to facilities offered locally, a number of selected engineering graduates should proceed to England to take a recognized course in a large works. This would be greatly to the advantage of the manufacturer and the agent in China. We have taken up this matter with British firms, the Federation of British Industries etc. and have arranged for a few students to go; but we want a more definite system to encourage our graduates to go to Britain. It has been suggested that Chinese students will not spend this extra period of training in practical work; but we have had many cases of graduates who have expressed a desire to go to England. We have had correspondence, and a general statement of agreement on this matter of sending graduates to England, with the Jardine Engineering Corporation, Shanghai. That firm, it may be mentioned, have employed for years some of our engineering graduates and have reported favorably upon them. At the present time we have requests for several mechanical engineering graduates which we are unable to answer as we would wish, because such graduates are not available. We suggest that firms might communicate in good time and arrange to take men if and when they graduate.

The Time of Training

The suggestion that a large part of the practical training should be completed before admission to the University, even if it were possible, is fundamentally unsound, and has been abandoned both in England and America. It is realized that a student who has completed his theoretical training first, can pick up the practical work so much faster than one who goes direct from school to the works, that the total training time is reduced, the student also has received benefit from his instruction in the University because he has seen the reason for processes in the works instead of failing to understand such things.

Further it is the experience of teachers both in England and Hong Kong that a boy who is to reach matriculation standard at a reasonable age must devote his entire time to the subjects in which he will be examined. Even in England, where the boy is

taught in his native language, only a small proportion reach matriculation standard at the specified age ; and the difficulties for a Chinese who must be taught in a foreign language are so much greater that it would be impossible for him to find time for any practical training prior to matriculation without seriously impairing his chances of success in the examination.

We are however alive to the possibility of an undergraduate doing practical work in his summer vacation and we encourage all engineering students in this. We would welcome greater facilities for this purpose if they can be provided by the works in the Far East. This vacation work undoubtedly tends to make the theoretical instruction easier and more effective ; it would compensate to a large extent for the lack of mechanical instinct which is noticeable in the majority of our Chinese undergraduates. It might be made a condition of donor scholarships that two summer vacations should be spent in the works.

We are of opinion, however, that for the present such vacation work must in general be voluntary and cannot be enforced as a qualification for the Degree, as it is not compulsory in any University. We advocate encouragement rather than compulsion in this matter with Chinese students. Even if the Board of Faculty favored the idea of compulsion it is doubtful whether the Senate would agree. If those difficulties were overcome, compulsion would probably tend to make students take some less strenuous course—in, let us say, the Arts Faculty—to obtain a University Degree ; or, more probable, send them abroad, where they believe, even now, they can gain an engineering degree more easily than in Hong Kong. We think, however, that this idea of vacation work might well be developed and we encourage our students to take it up in local establishments.

Many schemes for supplementing the University course have been under consideration. It was, many years ago, discussed by the members of the Faculty that there might be introduced what is known in Britain as " the sandwich " system of training. We do not think that identically the same system is applicable to Hong Kong. This " sandwich " system involves six months, alternately, in works and at the University. It is obviously not applicable to the civil engineers. It would lead to duplication of classes in the University which means inevitably more staff, because, during the first three years at the University, the civil, mechanical and electrical engineers take practically the same course. They all obtain instruction in the elements of civil, mechanical and electrical engineering, as is arranged in the University of London.

We think, however, that the " student apprentice " might be given the opportunity to make up part of the time of his post-graduate course in the works while he is an undergraduate and during vacations ; only picked students could do this as the average student does need the time in the long vacation to go over and work up the notes, experiments etc. that he does during term time.

While there are other matters concerning technical education of the University type which we might discuss at length, we trust that the statements above make it quite clear that we are anxious to amend, from time to time, the Engineering curriculum in the University as experience requires. We are anxious to co-operate with firms interested in China and the manufacturers of engineering products.

Technical Schools

We now have to consider the possibility of technical education in China other than that leading to a degree. In England there are polytechnics, technical schools etc. of various grades in which day and evening classes are held. There schools are for artisans etc., and in all cases those attending have a sound elementary education. In China, practically nothing of this nature has been attempted.

The Hong Kong Government for many years has had a Technical Institute. The Institute named has had no connection with the University. It is not under the supervision of an engineer. At the request of the Education Department of the Hong Kong Government the University Authorities have permitted the use of the equipment of the University for certain classes arranged with the Technical Institute. These classes are worked in the English language and would therefore be unsuitable for the average Chinese workmen or apprentices. We suggest that Chinese graduates could conduct evening classes at a Technical Institute ; but these graduates will require the advice and supervision of experienced technical teachers.

In Shanghai there seems to be a possibility of development of this type of technical education by what is known as the Lester Trust. Provision was made for this in the will which bequeathed a great deal of money for various educational purposes for the benefit of Shanghai residents. It is difficult to obtain information as to the plans of the Lester Trustees in this connection ; but it seems certain that the public spirited citizen of Shanghai who entrusted them with the carrying out of his wishes had in mind some scheme of technical education of a polytechnic type. That such a development will be useful is apparent. It is to be hoped that not only the Lester Trust, but the Shanghai Municipal Council and the Hong Kong Government will gradually evolve schemes for giving elementary technical instruction in the vernacular to Chinese youths ambitious to become good craftsmen. It is a subject that might also engage the attention of the Central Government of China.

The Moneyed Class

Although it is desirable to do something in the way of technical education, of an elementary type, for Chinese artisans, it must be apparent that the development of the natural resources and the improvement in communication, can only come from the efforts of the educated classes. The artisans and foremen are the rank and file ; but the initiative and planning must come from the more highly trained class. Engineering projects cannot be carried out without the consent of those in authority.

There has been a great deal of criticism of the Chinese " returned student." It may be that the system of sending youths direct from school to Universities in Europe and America has proved, in general, a failure. There can be no doubt that it is very much better for them to go from school to some University in the Far East. If, after graduation (usually at the age of about 22 years) it is possible to proceed abroad for post-graduate studies or practical experience in a works, that makes the graduate qualified to be useful in China. But there is one thing which must be credited to the " returned students." Those who have been trained in applied science work abroad have urged, in China, that the natural resources of the country should be developed. In many cases they have persuaded friends and relatives to put up money for engineering projects. Yesterday there called at the University of Hong Kong a " returned student " who required information on a technical matter. He had spent five years in one of the best of the American Universities that have Applied Sicence Departments. He had initiated two entirely different engineering projects. For one of these projects he had placed orders worth $300,000 (silver) and for the other project the machinery cost $200,000 (silver).

It may be true that many of those Chinese youths who go abroad to Universities have been disappointed that they find no positions awaiting them in their own country. It may be true that the knowledge they acquire is superficial. The blunt fact is that young Chinese men and women are determined to obtain what is called " Western learning." Those of us who are engineers believe that most of them should have an applied science training. Some of us are firmly convinced that they should obtain as much of that training as is possible while keeping in close touch with their families.

An Appeal for the Chinese Engineering Graduates

There are now good facilities in China for training engineering graduates. What is needed is a system for enabling these graduates to obtain two years of practical experience after they have graduated. Then they will be " qualified practical engineers." It must be emphasized that a " qualified practical engineer " needs training both in theory and in practical work. In a University he can obtain all the theory needed by the average engineer. In some Universities he can obtain a certain amount of experience in handling tools, engines etc. but even with that he must have further practical experience of actual commercial conditions before he is a " qualified practical engineer." It those who are interested in the development of engineering work in China will communicate with the writer with suggestions for arranging practical experience for graduates and undergraduates the authorities of the University of Hong Kong will carefully consider such plans. They will willingly co-operate with any who wish to assist in training engineers capable of developing the natural resources in China.

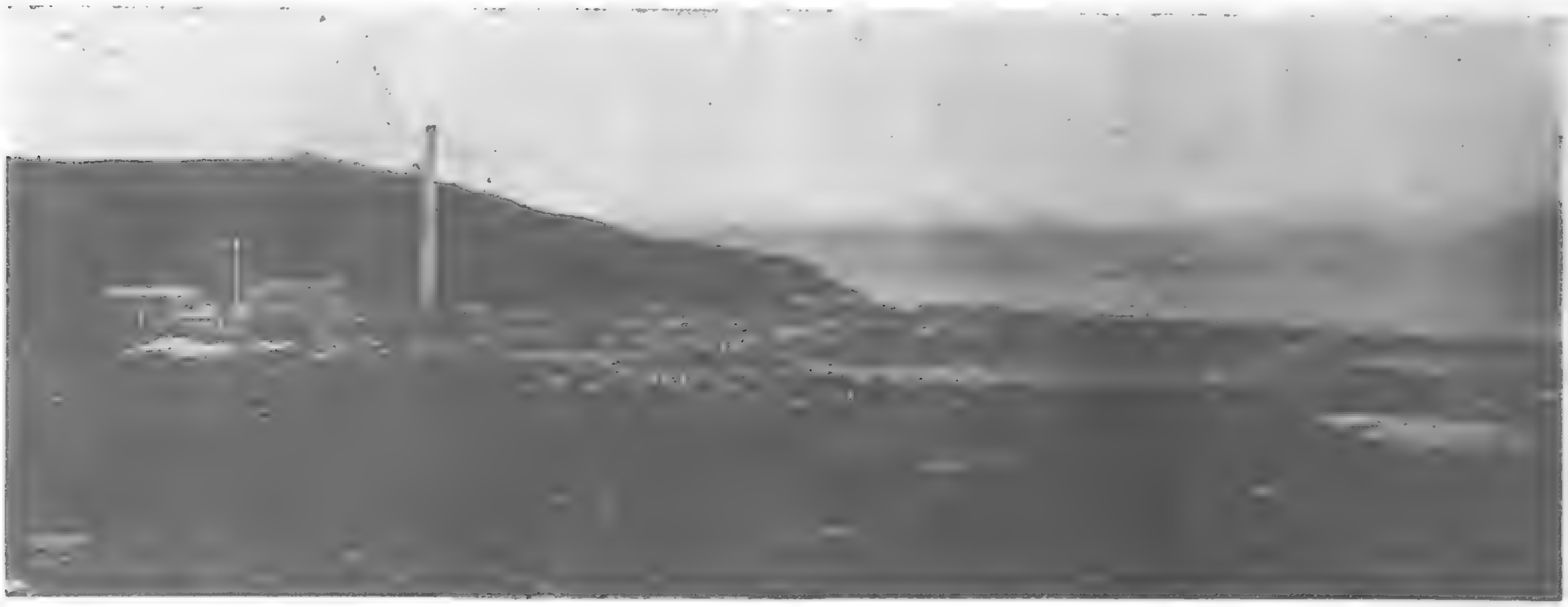


Fig. 2.—Shiritori Mill of the Fuji Paper Company

Largest Paper Mill in Asia

The Shiritori Mill of the Fuji Paper Company of Tokyo

BEFORE giving a description of Shiritori, the latest and finest addition to the plants operated by the Fuji Seishi, it may be opportune to give a short outline of the development of the Fuji concern in general. The origin of the Fuji Seishi K. K. must be traced back to the year 1890 when No. 1 Mill in Fuji was founded. Situated in the small village of Fuji at the base of the famous Mt. Fuji, it was but natural and augured well that the newly established manufacturing concern took the name of Fuji Seishi K. K.

From this first small mill, two more mills sprung up, *i.e.* the Fuji No. 2 and 3, forming the nucleus of the Fuji concern, since most of the other plants were subsequently acquired by amalgamating existing plants as will be seen from the table in which the plants constituting the present-day Fuji concern are tabulated with their equipment in paper machines, grinders and digesters.

General

The last addition to the numerous plants Owned and operated by the Fuji Seishi K. K. was, as above mentioned, the Shiritori Mill and it is but natural that in designing the plant and selecting the equipment all the experience collected in the other mills as well as making use of the latest advancement of the art outside Japan, that everything was most carefully considered so that Shiritori can be really spoken of as the last word in paper mills.

Work was started in May 1924 and by the end of 1926 the mill was finished at an outlay of Y.15,000,000, commencing commerical operation in January 1927.

Shiritori, prior to the establishment of the paper mill, was quite a small, inaccessible and insignificant fishing village of about 500 inhabitants, mostly fishermen, and at the first glance it may appear strange that such a place was chosen. But the reason the paper mill was put up just at that place has a very simple explanation from the fact that in and around it there is not only a rich timber area, but, and what counts far more, a good and ample supply of suitable water furnished by the river Shiritori which at that point flows into the sea. The same river is also used for floating timber, thus the transportation of logs is solved very conveniently and in an extremely cheap way.

Furthermore, quite close to the mill site, a coal seam was found yielding a satisfactory coal of 9,500 B.T.U. per lb. for the boilers, it was considered that the small fishing place would make an ideal place for the new mill, its only drawback being its accessibility which at that time was rather difficult. Meanwhile, however, the railway has reached Shiritori, connecting it with Ochiai, assuring a very efficient and reliable communication all the year round.

Fig. 1.—Fuji No. 1 Mill

The Equipment

The Shiritori Mill covers a total area of 320,000 Tsubo of which 15,800 Tsubo are covered by buildings, the greater part of which are up-to-date reinforced concrete structures, housing all the valuable machines and stores, while the other lesser buildings are of wood.

By far the greatest part of the ground is taken up by the extensive supplies of log, as will be seen from the photo.

As the wood is floated down the river a strand log haul-up and conveyors are arranged for landing, piling-up the logs as well as transporting them to the mill. The length of these conveyors amounts to about 700 meters.

The logs reach the mill in the wood preparation department. Here the logs are first barked and cut into proper length, following which, the wood is treated in keeping with the requirements of the ultimate product.

Name of Mill	Established in	Paper Machines: Year of installation	Type of Machine	Producing	Width of Wire-Cloth	Grinder: Number	Type	Output in Metric Tons	Digester: Number	Output in Metric Tons	Capital invested	
Fuji No. 1 Mill	1890	1890	F.	P.P.	84	4	P.	21.4	4	11.0		
		1895	F.	P.P.	98							
		1909	H.F.	N.P.	86							
Fuji No. 2 Mill	1897	1897	H.F.	N.P.	84	4	P.	44.1	—	—		
		1901	H.F.	N.P.	100							
		1901	H.F.	N.P.	100							
		1911	F.	P.P.	86							
Fuji No. 3 Mill	1908	1908	C.M.	M.B.	86	2	P.	21.4	2	30.3		
		1910	C.M.	M.B.	75							
		1911	F.	D.P.	92							
		1921	Y.F.	—	88							
Shibakawa Mill	1898	1898	F.	N.P.	98	3	P.	17.8	3	9.8		Formerly Yokkaichi Paper Mfg. Co. taken over 1920.
		1906	F.	M.P.	84							
		1908	F.	N.P.	84							
Kanzaki Mill	1894	1906	F.	A.P.	85	2	P.	16.7	—	—		Formerly Noda Paper Mill taken over in 1915.
		1925	C.M.Y.	M.B.	72							
		1923	C.M.Y.	J.P.	94							
		1899	F.	P.P.	74							
		1899	F.	A.P.	65							
Kioto Mill	1873	1897	F.	P.P.	88	—	—	—	—	—		Founded in 1873 by the Prefecture, 1879 taken over by the Umedzu Paper Mfg. Co. and 1924 amalgamated with the Fuji concern.
		1906	Y.F.	P.P.	100							
		1915	F.	P.P.	74							
Kumano Mill	1913	1916	F.	P.P.	86	—	—	—	—	—		Formerly Kumano Paper Mfg. Co., amalgamated 1924.
		1920	F.	P.P.	86							
		1923	F.	P.P.	113							
Senju Mill	1888	1896	F.	P.P.	111	2	P.	8.7	—	—		Formerly Tokyo Itagami Paper Mfg. Co., amalgamated in 1920.
		1917	C.M.Y.	J.P.	118							
		1888	F.	P.P.	86							
		1907	C.M.	S.B.	74							
Edogawa Mill	1922	1922	F.	P.P.	108	1	P.	8.7	—	—		
		1922	F.	P.P.	108							
		1923	F.	I.P.	108							
Nakagawa Mill	1920	—	F.	N.P.	74	—	—	—	—	—		Formerly Nakagawa Mill of Dai Nihon Paper Mfg. Co. amalgamated in 1925. Mill now stopped.
		—	F.	N.P.	74							
Ebetsu Mill	1908	1908	F.	N.P.	100	13	P.	110.9	4	44.6		
		1908	F.	N.P.	100							
		1900	F.	N.P.	100							
		1925	F.	W.P.	85							
		1920	F.	N.P.	186							
		1928	F.	N.P.	142							
Kanayama Mill	1908	—	—	—	—	3	P.	21.8	—	—		
Ikeda Mill	1918	—	—	—	—	—	—	—	3	60.2		
Kushiro Mill	1916	1927	F.	N.P.	142	6	P.	53.5	1	22.0		Formerly Hokkaido Industrial Co. amalgamated in 1919.
		1916	Y.F.	P.P.	95							
		1916	Y.F.	P.P.	95							
		1922	Y.F.	P.P.	100							
Ochiai Mill	1915	1921	F.	K.P.	76	—	—	—	4	89.2		Formerly the Japan Chemical Pulp Co. amalgamated 1922.
		1925	Y.F.	K.P.	116							
		1927	Y.F.	K.P.	116							
		1927	F.	K.P.	120							
		—	F.	K.P.	110							
Shiritori Mill	1924	1926	F.	N.P.	142	3	S.G.	67.0	4	80.3	15,000,000	
		1929	F.	I.P.	142							
		1926	C.M.	M.B.	102							

EXPLANATION OF ABBREVIATIONS:

F.	=	Fourdrinier Machine
C.M.	=	Cylinder Mould Machine
C.M.Y.	=	Cylinder Mould Yankee Machine
Y.	=	Yankee Machine
Y.F.	=	Yankee Fourdrinier Machine
P.P.	=	Printing Paper
N.P.	=	Newsprint
M.B.	=	Manila Board
A.P.	=	Art Paper
J.P.	=	Japanese Paper
I.P.	=	Simili Paper
S.B.	=	Straw Board
K.P.	=	Kraft Paper
D.P.	=	Drawing Paper
M.P.	=	Match Paper
W.P.	=	Wrapping Paper

The total capital invested in the 16 plants amounts to Yen 77,700.00 and, excluding the straw board machine (Senju Mill) the Fuji concern controls:

Fourdrinier machines	33	3	411 inch. (in total)
Harper Fourdrinier machine	4		370 „ „
Yankee Fourdrinier machine	6		610 „ „
Fourdrinier Tissue machine	1		100 „ „
Cylinder Mould machine	4		263 „ „
Yankee Cylinder Mould machine	3		284 „ „
In total	51	5	038 inch.
Pulp Machines	4		476 „
Coating Machines	4		260 „
Further: Grinder	43 sets producing 392 tons		
and, Digester	31 sets producing 414 tons		

Fig. 3.—Wood Preparation

Fig. 4a.—Grinder Room, Ground Floor

Thus, for the production of chemical pulp the logs are chipped up and passed on to the digesters while the other logs, cut in proper length of 4-ft, are sent to the grinders. Both, chemical and mechanical pulp meet again in the beaters where they are properly mixed, the stock thus prepared, being finally brought on the paper machines finishing up in neatly packed paper rolls ready for transportation to the printers presses. (Fig. 3).

On the way from the staple to the store room the material which finally becomes paper, passes quite a number of stages. Space, however, does not permit of doing so, for which reason only those parts of the equipment which show a marked departure from the conventional shall be specially mentioned.

First in this respect stand the grinders which are of a new type. Continuous grinders, as they are called, were already very well known in America and Europe but in Japan they were still looked upon with critical eyes and the good reports which reached this country from America and Europe still met with some doubt. It stands to the credit of Mr. Okawa, that Shiritori has this type of grinder. The results obtained fully justified his decision.

By referring to Fig. 4 and leaving aside all unnecessary details, it will be observed that the grinder in principle consists of the stone running in the heavily designed base, the hopper with the powerful pair of chains on each side of the hopper and the chain-drive with advance regulator.

As may be seen from Fig. 5 the grinder is filled from the second floor and by the steady advance of the chains the column of wood in the hopper is forced on the grind-stone to such an extent that by means of the advance regulator constant load on the driving motor of the grinder is maintained. It is obvious that, provided proper feeding, advance is uniform as well as steady and production constant.

The difference between the old pocket grinder and the new type shows an almost constant grinding temperature for the continuous grinder resulting in a particular high quality of pulp.

A novelty, so to speak, for a mill of that description is the presence of a large beater-plant which consists of 11 beaters each of 2,000 lbs. contents. (Fig. 7). There is one newsprint machine of 142-in. wire width for a speed of 230 to 1,200-ft./min. Fig. 8, one machine for Simili paper of 142-in. and a speed of from 70 to 500 ft./min., one cylinder mould machine for Manila Board of 104-in. and a speed of from 40 to 150-ft. Fig. 9 and one pulp machine of 120-in. and 60 ft./min. Fig. 10.

The first mentioned newsprint machine deserves special mentioning since she is the fastest paper machine in the Orient.

It is of the Fourdrinier type, equipped with High-Slice-Stock-Inlet and fixed table, no shake device being arranged. There are 3 wet-presses of the ordinary type and a dryer part consisting of 3 groups of which the first and second comprises 16 dryers, and the third 11 dryers each of 1,500 m/m diam. Each group has two felt dryers of 1,250 m/m diameter each. The end of the dryer-part is made up by one cooling cylinder also of 1,500 m/m diameter. Since the high speed does not permit of passing the paper through the dryer part by hand a Sheahan rope-carrier is doing the work of passing the paper through and on to the 10-stack-calender with Schurmann arrangement of the bowls. On and in the calender the web is assisted through by compressed air.

Fig. 5.—Feeding Floor for Continuous Grinder

Fig. 7.—View of Beater Room

Fig. 8.—142-in. Newsprint Machine

Fig. 9.—Manila Board Machine

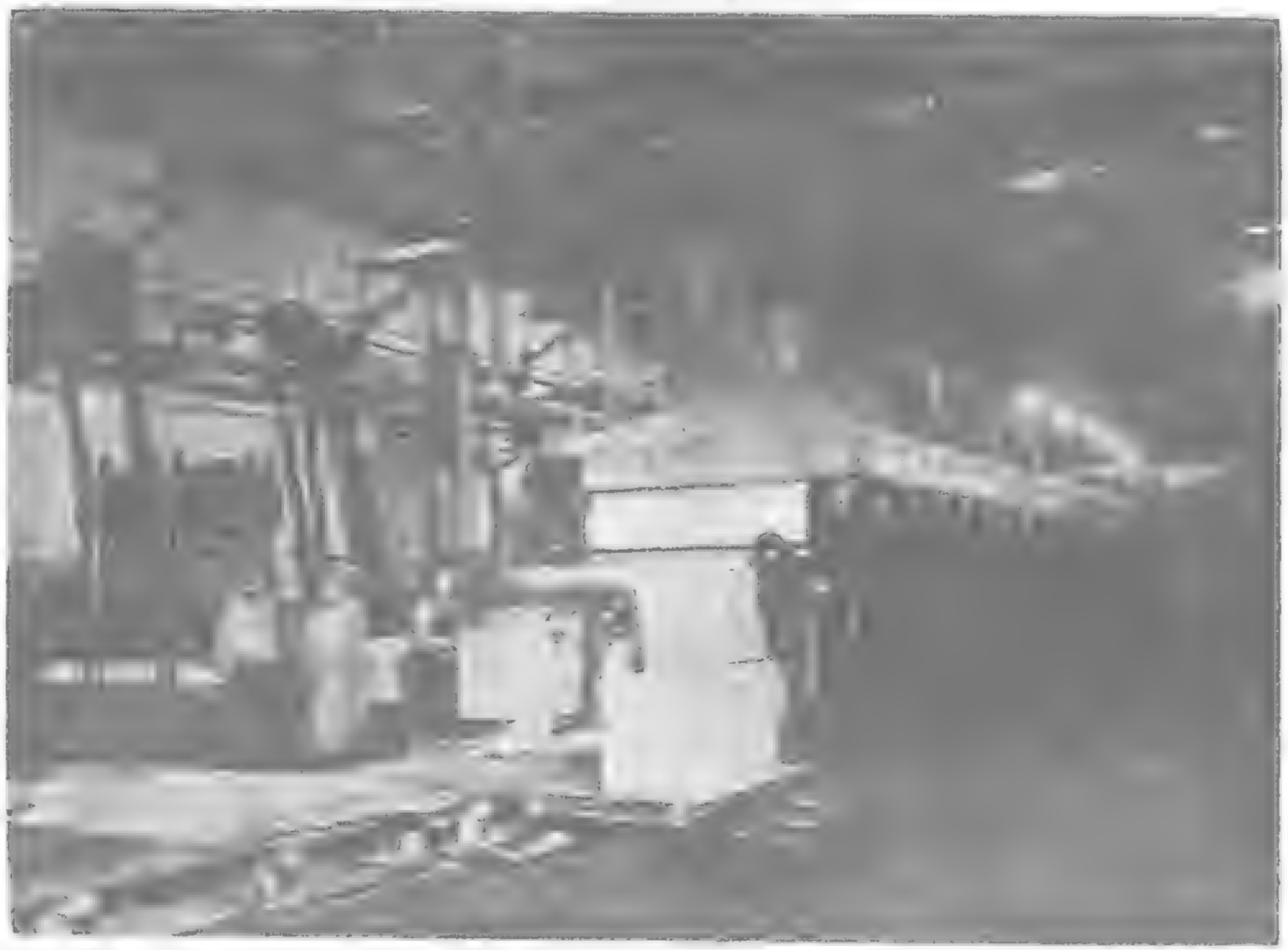


Fig. 10.—120-in. Pulp Machine

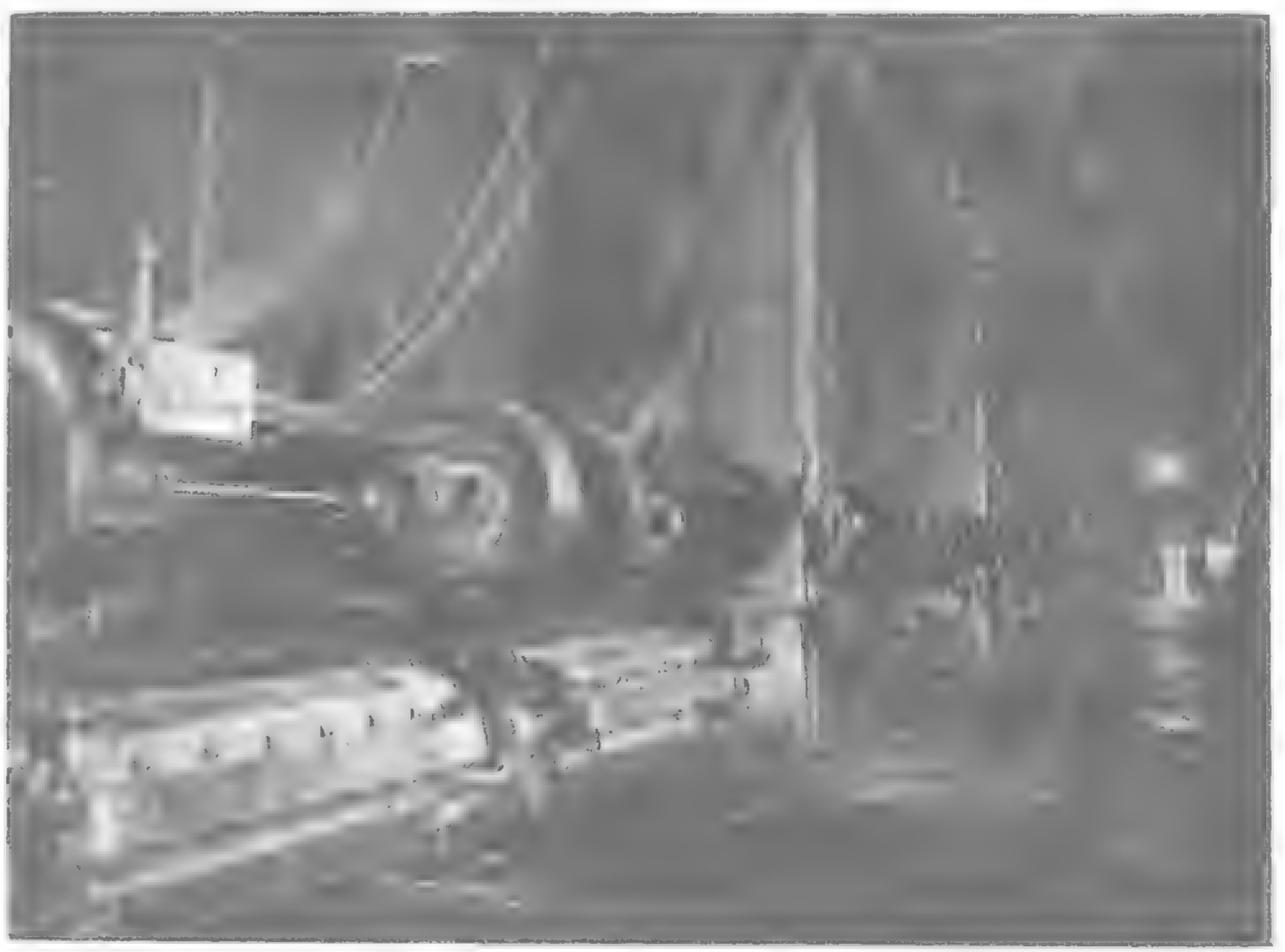


Fig. 11.—View of Boiler Room

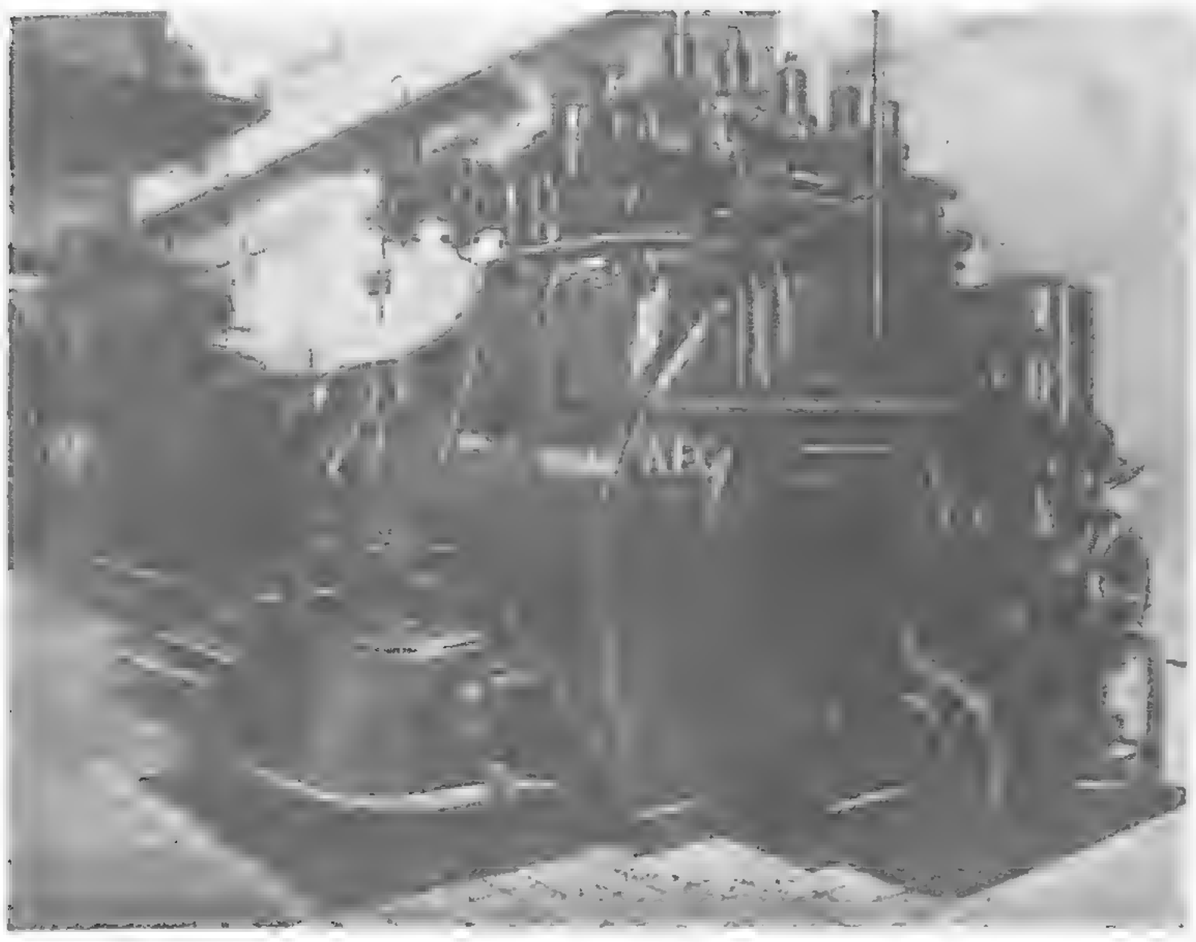


Fig. 12.—Main Steam Turbo A.E.G. Generating Set

Fig. 3a.—Store for Finished Rolls

The drive of the paper machine is of the multi-motor sectional type a comparatively new application in Japan at the time of installation.

The Power Plant

For the generation of power as well as steam needed in the various departments, the mill possesses an individual power plant.

The boiler house Fig. 11 contains eight boilers of the water tube type of which six are Garbe and one Babcock & Wilcox, They are laid out for a working pressure of 300 lbs/sq. in gauge and 650°F. steam temperature at the superheater outlet. The boilers are equipped with underfeed forced draught travelling stokers and Green's economizers.

The power house contains one 8,000 Kw., 3,300 Volts, 3,000 r.p.m. Turbo-Generator set Fig. 12 for steam extraction at a pressure of about 35 lbs/sq. in abs. This steam is required for the dryer part of the various paper machines of which the turbine can furnish up to 44,000 kgr./h. when running at full load. Besides, in case of need, an oil pressure controlled Bye-Pass-Valve furnish about 20,000 kgr./h. at 35 lbs/sq. in. abs. by reducing the boiler pressure to the afore-mentioned figure.

Fig. 12 shows in the background the evaporator and boiler feed water preparing plant which is capable of furnishing 33,000 lbs/h.

The 8,000 Kw. set takes the lead in furnishing the power of the mill. Parallel with this set another 1,000 Kw. turbo-generator set with automatically maintained back pressure of 100 lbs/sq. in. is running, the load of which is adjusted so as to meet the steam required by the digesters.

By this arrangement highest economy is obtained. The design of this auxiliary turbine permits, however, in case of need, for instance during holidays to run this set on the condenser or on the steam heating system of 35 lbs/sq. in., or on both at the same time which means that the excess steam not absorbed by the heating system of the mill plus evaporator plant is let to the condenser.

As stand-by for the 8,000 Kw. turbo-generator a 5,000 Kw., 3,000 r.p.m. Ljungstreom turbo-set with condenser is installed.

For the operation of the mill, there are three large motors of 1,630 H.P. each (coupled to the grinders), 158 motors in various sizes from 5 H.P. to 250 H.P. per motor and 40 motors with less than 5 H.P. each.

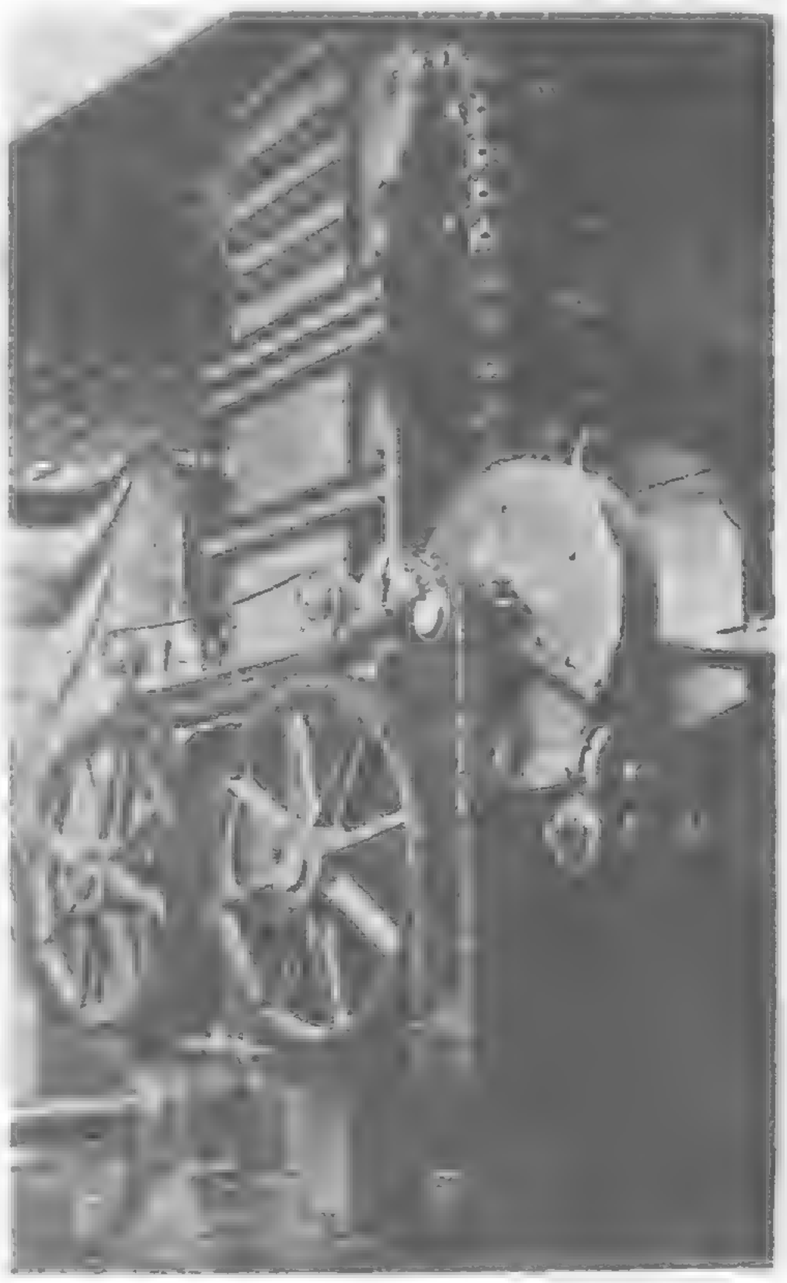


Fig. 4.—Continuous Grinder, Patent Voith

The production of the mill amounts to :

Newsprint	45,000,000 lbs	(abt 20,100 tons)
Simili paper	28,800,000 ,,	(,, 12,800 ,,)
Manila Board	20,880,000 ,,	(,, 9,300 ,,)
Dryed pulp	10,800,000 ,,	(,, 4,800 ,,)

The Mill's staff comprises 104 office men and about 1,000 workmen and employees of all degrees.

Since Shiritori was quite a small fishing place it is not to be wondered at that there were neither housing facilities nor any other facilities necessitated by such an influx of persons directly or indirectly concerned with the new enterprise.

To meet these difficulties the management of the mill not only built 105 houses for the families of the staff but also 406 houses for families of workmen in addition to which one dormitory for the unmarried members of the staff and two dormitories for the unmarried workmen were erected. Also a hospital for ordinary cases and another for infectious diseases under the care of four doctors were erected giving aid and treatment to the members and families of the employed.

Owing to the remote location of the mill and the rather poor and backward condition of the local population it was also a necessity for the Mill management to go even further taking in hand the construction of public bath-houses, establishing of an efficient and hygienic barber, a large store which provides for the daily needs of the households at cheap prices.

In order to raise the efficiency of the workmen a night school was established in which by efficient teachers they are taught the essentials incidental to their trade.

For the prevention of fires a fire brigade equipped with motor and various hand pumps and other necessary appliances for fighting fires was created to whom also the policing of the extensive premises, assisted by a number of watch-dogs, is assigned.

Thus by the well directed and concentrated initiative of a couple of high spirited men, a place, desolate and forgotten before has been transformed into a busy center of activity with a model of a paper mill as the center and all that within the short time of a couple of years. The connection of the place to the world's commercial arteries established, Shiritori, before hardly known, to-day sends out its goods to all parts of the Japanese Empire the high quality of which is generally accepted; a good example of what an enterprising spirit may achieve.

New Coal Pier for South Manchuria Railway Company*

By CHARLES BISHOP KINNEY

On July 1 the new coal pier for the South Manchuria Railway Company, located at Kanchingtsu, a village across the bay from Dairen, was completed and ready for operation. Final tests of the various machinery have been given; the dredgers have left; and the markings for buoys have being carried out. The first coal ship is expected to dock at the new pier in the middle of the month.

It is claimed that the new coal pier, while not the largest, is one of the most modern in the world, as the latest designed machinery furnished by Alliance Machine Company, of Alliance, Ohio is used. This statement was made recently by Mr. J. N. Alter, an American engineer who superintended the erection of the coal dumpers and coal conveyors.

Four years ago, Kanchingtsu was only a small Chinese fishing village, hardly known by Dairen residents, even though it is only five miles away by direct water route, and people seldom, if ever, mentioned the place. To-day it is a small, modern town, Westernized in every detail, and populated by Orientals. Plans are now being formulated to enlarge the town; it is reported that a primary school will soon be established. A new dirt motor road has just been completed which circles the bay of Dairen and connects Kanchingtsu with the city, a distance of 15 kilometers. Ferries ply back and forth at fifteen minute intervals, covering the five mile course in twenty minutes.

There is no passenger train service to Kanchingtsu, and there is really no call for it. Coal trains coming from Fushun will branch off at Nan Kwang-lin (a station on the main line, not far from Dairen) and travel a distance of approximately 12 kilometers to Kanchingtsu. This branch line is single tracked.

Construction of the new coal pier was started on July 9, 1926. The total cost of land rights, materials, machinery, railways, labor, etc. amounted to Yen 11,133,000. The officials in charge of operations figure that approximately 3,800,000 tons of coal will be exported from Kanchingtsu annually. Most of this will go to Japan, China and the East Indies.

The coal pier is protected by a long, well constructed breakwater, 973.68 meters in length. Five buoys and one light-house will enable ships to find the deepest channel leading to the pier.

The pier is 300 meters in length and 34 meters in width, built mostly of cement, thus ensuring not only strength but durability. Four ships, each of 8,000 tons capacity, can be accommodated at one time, the depth of water at low tide being 30 feet. The difference in tide at the coal pier is from seven to nine feet.

The writer spent half a day at the coal pier, examining the machinery and the rest of the plant, with two American engineers, who kindly undertook to explain the details, from beginning to end, of the new pier.

The coal, mostly bituminous, comes from the Fushun coal mines, which are operated by the South Manchuria Railway Company. Now that coal pier is ready for operations, all the coal heretofore carried to Dairen for export purposes will be brought to Kanchingtsu. A large coal yard, already completed, is located about three-quarters of a mile from the pier, and can hold approximately 3,000,000 tons of coal. Two large, up-to-date cranes have been installed there for the purpose of quickly re-loading coal cars when necessary.

Cars loaded with coal are placed at the beginning of the pier and the couplings are disconnected. The car of coal is then hauled by a wire cable or electrical mule, attached to a barney or hauling car up a 15 per cent. incline to the first rotary dumper. Here the coal car is turned over and the contents slide into a special car which, after it has been filled, is immediately carried to the second rotary dumper. These special coal cars are carried to the second dumper by electric engines. The coal is then discharged into a receiving hopper, where a belt with bins carries the coal over a boom conveyor. The boom conveyor extends from the hopper over the sides of the vessel, and 900 tons of coal can be placed into a ship per hour from each conveyor. Three new coal conveyors have been installed, thus making it possible to ship 2,700 tons of coal per hour from Kanchingtsu.

All the machinery is run by electricity, eliminating extra man power, unnecessary noise and danger. The entire transfer of coal from railway cars to dumpers and to conveyors is designed to eliminate abrupt falling of the coal and thus breakage is avoided. The new coal pier, experts claim, is the most modern type in the world and the largest in the Far East.

(Four Illustrations see next page).

*Detailed Description and Plan appeared in the February, 1929, issue of *The Far Eastern Review*.

N.Y.K to Scrap Old Passenger Ships

It is reported that the Nippon Yusen Kaisha, which has recently constructed a number of motor-vessels of the most up-to-date type, has decided to weed out its superannuated vessels, seven in number, all passenger-ships, ranging from 6,000 to 13,000 tons with the aggregated tonnage of 48,831.

The vessel that heads the list is the S.S. *Tenyo Maru*, 13,500 tons, which has long been placed on the Orient-American line and which saw her last service last month and is now moored at Kobe. It is understood that an offer was at first made by a breaking-up firm for the purchase of this vessel at the price of Yen 360,000, but that on the 14th of the present month arrangements were entered into between the Nippon Yusen Kaisha and a certain American shipping interest at Los Angeles for the sale of the *Tenyo Maru* at the price of about Y.400,000.

It is also reported that two steamers, *Awa Maru* (6,028 tons) and *Sado Maru* (5,898 tons), which have been on the run between Japan and Seattle and which have taken pride in the quality of the materials used for the construction of their hulls, have been sold to the Osaka Kaiji, whose business is to dismember steamers, at the price of Y.141,000 and Y.135,000, respectively. It is said that work for the dismemberment of these two vessels will be commenced before long.

In addition to the vessels above-mentioned, arrangements are being made, it is understood, for the sale of four other ships of the Nippon Yusen Kaisha, namely, *Kaga Maru* (5,860 tons) on the Australian line, *Tamba Maru* (5,846 tons) on the Bombay line, *Kamakura Maru* (5,846 tons) on the line along the eastern coast of South America, and *Kanagawa Maru* (5,853 tons) on the same line as last mentioned.

With this sweeping readjustment of the Nippon Yusen Kaisha as a start, it is rumored, other shipping companies in Japan will shortly follow suit, either mooring or dismembering their superannuated vessels so that they may be able to tide over the existing shipping depression.

NEW COAL PIER FOR SOUTH MANCHURIA RAILWAY AT KANCHINGTSU

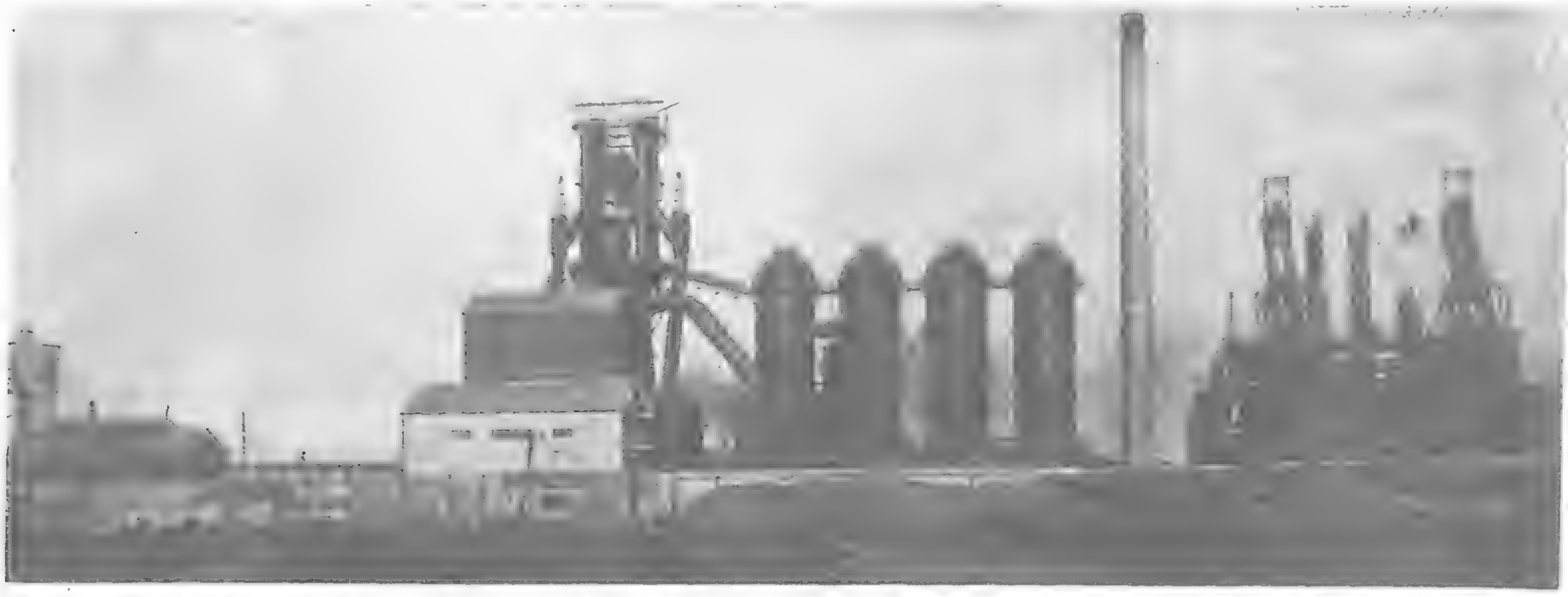
Equipped with Coal Dumpers and Conveyors Supplied and Erected by the Alliance Machine Company of Alliance, Ohio

The Coal Pier Under Construction. The Port of Dairen in the Background

Another Section of the New Coal Pier at Kanchingtsu

Boom Conveyor About to be Connected with the Receiving Hopper. The Boom Conveyor Extends from the Hopper Over the Side of a Vessel, and 900 Tons of Coal can be Placed into a Ship per Hour from each Conveyor

Laying the Foundation of the Extension of the New Coal Pier, Cement and Steel are Mainly Used



General View of the Blast Furnace Plant, Anzan Steel Works: No. 1 Blast Furnace, Daily Production, 300 Tons; No. 2 Blast Furnace, Daily Production 300 Tons; No. 3 Blast Furnace, Daily Production 500 Tons

New 500-ton Anshan Blast Furnace

THE completion of the new 500-ton blast furnace of the Anshan Steel Works, raises the pig iron production of the plant to 1,100 tons per day. A very complete description of the South Manchuria Railway Company's program for the expansion of the Anshan Iron Works into a steel enterprise, was published in the February 1929 issue of *The Far Eastern Review.* The old blast furnance plant at Anshan consisted of two 300 tons furnaces producing 200,000 tons of pig iron per year. These original furnaces were erected during the war and have since been worked to their full capacity. The erection of a new 500-ton furnace became imperative to permit the old furnaces to undergo necessary repairs; but it is really intended as a reserve unit in order to assure a constant minimum annual output of 200,000 tons.

The new 500-ton furnace was designed by Mr. Kohlhaas, Consulting Engineer of Perrin, Marshall & Company of New York, but its actual construction was carried out by various Japanese manufacturers; the steel castings being supplied by the Sumitomo Steel Works, the plate work by the Kawasaki Dockyard and other parts by the Dairen Engineering Works. The contract for the hoisting machinery and equipment went to the Otis Elevator Company of New York; the coke screening machine to the Robbins Conveyer Company; the furnace bell and hopper to the McKee Company and the fire bricks for lining the furnace to the General Refractory Company of America. The actual erection of the furnace was carried out by the Anshan Engineers.

The new furnace has a capacity of 500 tons per day. It is 27.43 m. high with a hearth diameter of 5.64 m. and an inner volume of 693 cu.m. The following data was used as the basis for its design:

Analysis of Iron:

Si	1.50 -	1.80 %
C	over	3.50 ,,
Mn	over	1.20 %
S	under	0.04 ,,
P	under	0.35 ,,
Fe	about	94.00 ,.

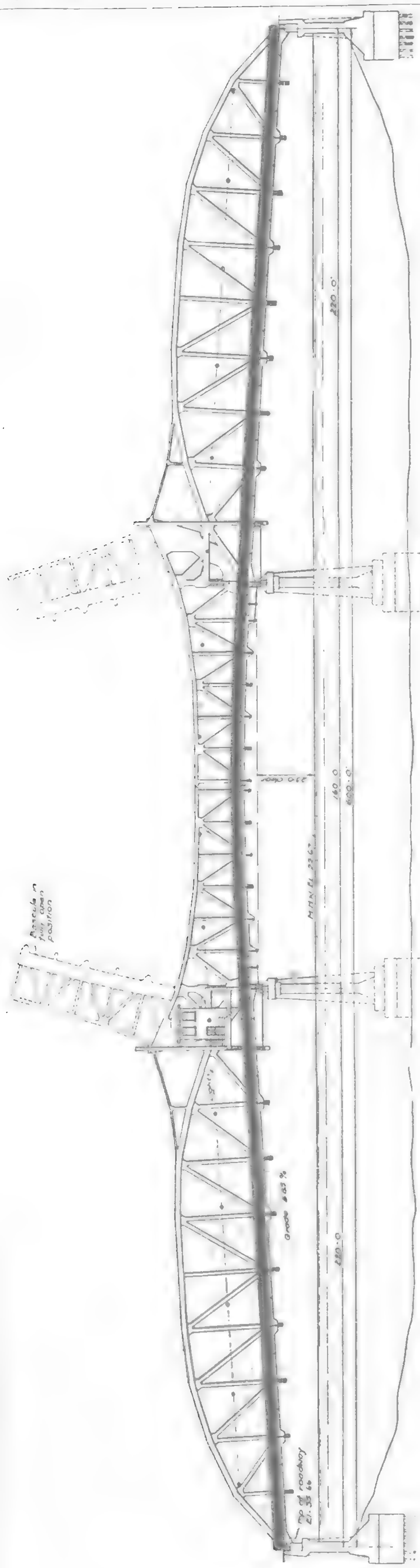
Metallic Charge:

The furnace is to operate fast all sinter burden with only small amount of iron scrap

sinter	1.750	per	1t	pig iron
iron scrap	0.025 t			,,
Coke Rate	1.0t	per	1t	pig iron
Lime Stone Rate	0.8t	per	1t	pig iron
Slag Quantity	0.9t	per	1t	pig iron

(Continued on page 399).

No. 3 Blast Furnace, Anshan Steel Works



Elevation of Scherzer Rolling Lift Bridge Over the Chukiang at Canton, Designed by The Scherzer Rolling Life Bridge Company of Chicago, Andersen, Meyer & Co., Contractors

Scherzer Rolling Lift Bridge Over the Chukiang or Pearl River at Canton

THE progressive spirit of the Municipality of Canton has again been shown by their decision to construct a modern steel bascule bridge from Waisun Road and the Bund, Canton, to the Island of Honam.

The contract for supply and erection of this bridge was awarded to Andersen, Meyer & Company, Ltd., and McDonnell & Gorman, (an American contracting company with head office in Tientsin) the latter part of last year. Work was started on the bridge site November, 1929, and the contractors are under obligation to complete the bridge and have it opened for traffic February, 1932.

The contract for the construction of the reinforced concrete piers and abutments as well as erection of steel fixed and movable spans and operating machinery is in the hands of Messrs. McDonnell & Gorman, who commenced construction work at bridge site November, 1929. Considerable progress has already been made in sinking caissons for piers and abutments and work in connection with the erection of steel abutment spans will be commenced early in 1931.

The contract for the fabricated steel fixed and movable spans also for operating machinery has been placed by Andersen, Meyer & Co. with the American Bridge Co. through the U.S. Steel Products Export Corporation.

A careful study of road traffic and navigation conditions was made by Andersen, Meyer & Company, Ltd. in collaboration with the Municipality of Canton before the rolling lift design was adopted. The original design was prepared by Andersen, Meyer & Company, Ltd., civil engineers, on data supplied by the Scherzer Rolling Lift Bridge Co., Chicago, and was selected by the Municipality of Canton as the most suitable design submitted. The conditions as ruling in Canton indicated a bridge capable of rapid opening whilst giving a wide navigation passage and to meet these requirements the Scherzer rolling lift bridge was decided on.

On account of the magnitude of this construction undertaking, a short description of the bridge and the conditions under which it is being built will undoubtedly be of interest.

The bridge consists of two approaches, each 220 ft. span and two rolling lift bascules each 80 ft. span, the total length 600 ft. with the bascules in the open position there will be a maximum navigation passage of 115 ft. The roadway will be 39 ft. between curbs with two footwalks of 10 ft. each supported on the outside of the main trusses. The approach roadway will be of reinforced concrete supported on steel stringers and cross girders. Asphalt paving planks supported on timber decking will be used on the bascule roadway to give smooth and durable surface for traffic and the bascule footwalks will consist of timber planks. The gradient on the bridge will be 5.85 per cent.

Waisun Road, being in the heart of Canton, an elevated roadway would seriously hamper business in the adjoining shops, therefore the bridge has been designed sufficiently low to connect with the present road level and give sufficient clearance at the river span.

The bascule leaves are counter-balanced so that the electric operating motors have only to overcome the inertia friction and wind loads. In case of emergency, hand operation is provided for, eight men supplying through the hand operating gear sufficient power to open the bridge in four minutes.

The bridge is provided with traffic and navigation signals, lights for night use and semophores for day. The operator's cabin is placed on one side of the bridge. The total weight of steel in the structure is approximately 1,600 tons and of the operating machinery about 50 tons. The total cost of construction will be in the neighborhood of $2,000,000.

In connection with the construction of piers and abutments, a considerable amount of investigation was made prior to Andersen, Meyer & Company, Ltd. submitting plans and specifications for this bridge. Borings were taken of the river bed, which showed that hard red clay existed about 15 ft. below low water level. The sub-soil will be excavated down to this bed and bearing piles driven to a depth of approximately 50 ft. The foundation for the piers will be excavated by "open caisson" methods and the abutments excavated in watertight sheet pile cofferdams. Excavation and driving of sheet piles for abutments are already well under way and the sinking of the caissons for the piers will be commenced in from 30 to 60 days.

(Continued on page 374)

Demag Cranes in the Far East

THE constant growth of goods traffic and increasing mechanization of the means for transhipping and reloading goods during the last few years were responsible for a number of new loading plants being built in several Japanese ports. They embody the results of the very latest experience in the construction of hoisting appliances. Among other plant, the Demag A.G., of Duisburg, supplied 10 luffing cranes for the port of Keelung, one double crane of the Demag type for Dairen, and three great loading bridges for the port of Tsurumi, to deal with coal. Other plants are still building, especially some more loading bridges.

The Keelung cranes, *Fig. 1*, are of the level luffing type, which means to say that they can modify their radii when loaded, the load travelling on a level path. Compared to cranes with rigid jibs, luffing cranes hence possess greater mobility and adaptability, and they cover a larger area without shifting their position. Their main advantage, however, consists in the possibility of standing them in fairly close proximity of one another. This is tantamount to permitting more cranes to be brought into action on the same vessel. So the ship is able to clear the port again in much less time than before. The constructional principle the Demag adopted for these cranes is an extremely simple and utterly dependable one. In order to make the hook move on a level path, the load rope passes over a reversing pulley pinned to the end of guiding link. The link swivels on a stationary gudgeon at the rear end of the crane house. As the jib swings up or down in luffing, the pulley end of the link slides along the face of a guiding curve attached to the jib. The shape of the curve is such as to call forth lengthening or shortening of the rope in exactly the same proportion as the amount by which the jib head ascends or descends. In much the same way as the pulley link, another link with the weight balancing the jib also slides along the face of a guiding curve, on the jib, thereby adapting to the turning moment of the jib that of the counter-weight as referred to the jib's center of rotation. The current consumption of the crane, for luffing, is exceedingly small owing to this perfect balancing of the load and weights.

Fig. 1.—"Demag" Luffing Cranes for the Port of Keelung

Fig. 2.—"Demag" Cranes at the Port of Dairen

No ropes and chains are used to hold and luff the jib since they have the drawback of greatly reducing the manoeuvring properties of the crane and its trustiness in service if there is a strong wind blowing against the jib. Instead, the luffing motions are imparted to the jib by a spindle gear accommodated entirely within the crane house except for the upper part of the spindle which goes through the roof to engage with the jib. The luffing gear detains the jib with absolute certainty whatever its position may be, besides affording complete control of its movements.

The double crane at Dairen, *Figs. 2*, and *3* consists of a gantry spanning 33 ft. and crowned by a level luffing crane. The horizontal jib of the gantry carries a travelling crab. This type of level luffing crane, an invention made by the Demag, too, enables two hoisting appliances to serve the same spot at the same time. Having a maximum radius of 60 ft. and a minimum of 26 ft. the action of the luffing crane is based on the balance principle, which gives a very simple type of luffing crane since, besides the jib, there are only two more moving members for balancing the weights and making the load travel on a level path during the luffing. In practice, this is a feature of great importance as it warrants absolute reliability of the plant, while curtailing attendance to the utmost. Jib luffing takes place by means of a rack gear that holds the jib securely in every position.

The load capacity of the luffing crane is three tons and its hoisting velocity with this load 150 ft. p.min. The hoisting winch, however, includes a change-over gear allowing loads of 2 tons and less to be lifted at a speed of 220 ft. p. min. The crab on the horizontal jib deals with loads up to two tons at a hoisting velocity of 220 ft p.min. It has a driver's stand and travels along at a speed of 500 ft. p.min. The maximum reach beyond the edge of the wharf is about 35 ft. On the inland side, the crab may go as far as 13 ft. beyond the gantry legs. Hence the goods taken from the ship's hold can not only be deposited in railway trucks between the legs of the gantry, but on the verandah (width: 16 ft. approx.) of the wharf-side godown as well. Before the ships come alongside, the jib traversed by the crab should be withdrawn towards the inland side of the crane so as to prevent its colliding with the masts and deck superstructures of the vessels. This is done with an electric winch installed in a small engine house on the gantry. The winch hauls the jib backwards and forwards with the aid of ropes.

DEMAG CRANES AT THE MITSUI KAWASAKI WHARVES (TSURUMI)

Supplementing Illustrations in the May Issue of "The Far Eastern Review"

A special design was adopted for the gantry so that it may be used for landing passengers, too. For this purpose one of its water-side legs has a flight of stairs running parallel with the quay-side and extending up to the level of the godown verandah. The passengers reach the stairs over an hinged gangway sliding up and down on guides beside the stairs; its position can thus be adapted quite easily to the level of the ship's decks. From the top of the stairs another gangway takes the passengers to the verandah of the godown. This gangway bridges the railway lines beneath.

The coal loading plant built for the port of *Tsurumi* is the biggest one of its kind in Japan. Its three loading bridges serve to tranship coal between ocean-going vessels, river barges, railway trucks, and a store-yard. They bridge the store-yard and several railway lines with a span of 180 ft. and have hinged jibs 105 ft. long extending far beyond the water-side edge of the wharf, enough in fact to let them deal with one sea-going ship and two river barges alongside her at the same time. The lower booms of the main bridge girder and jib are traversed by a slewing crab with a load capacity of 10 tons. Fitted with an automatic grab of 8.5 cu. yds. contents, this grab chiefly conveys the coal between the watercraft and the store-yard, whereas the slewing crane travelling on the top booms of the bridge girder is reserved exclusively for the store-yard and railway

(Continued on page 361)

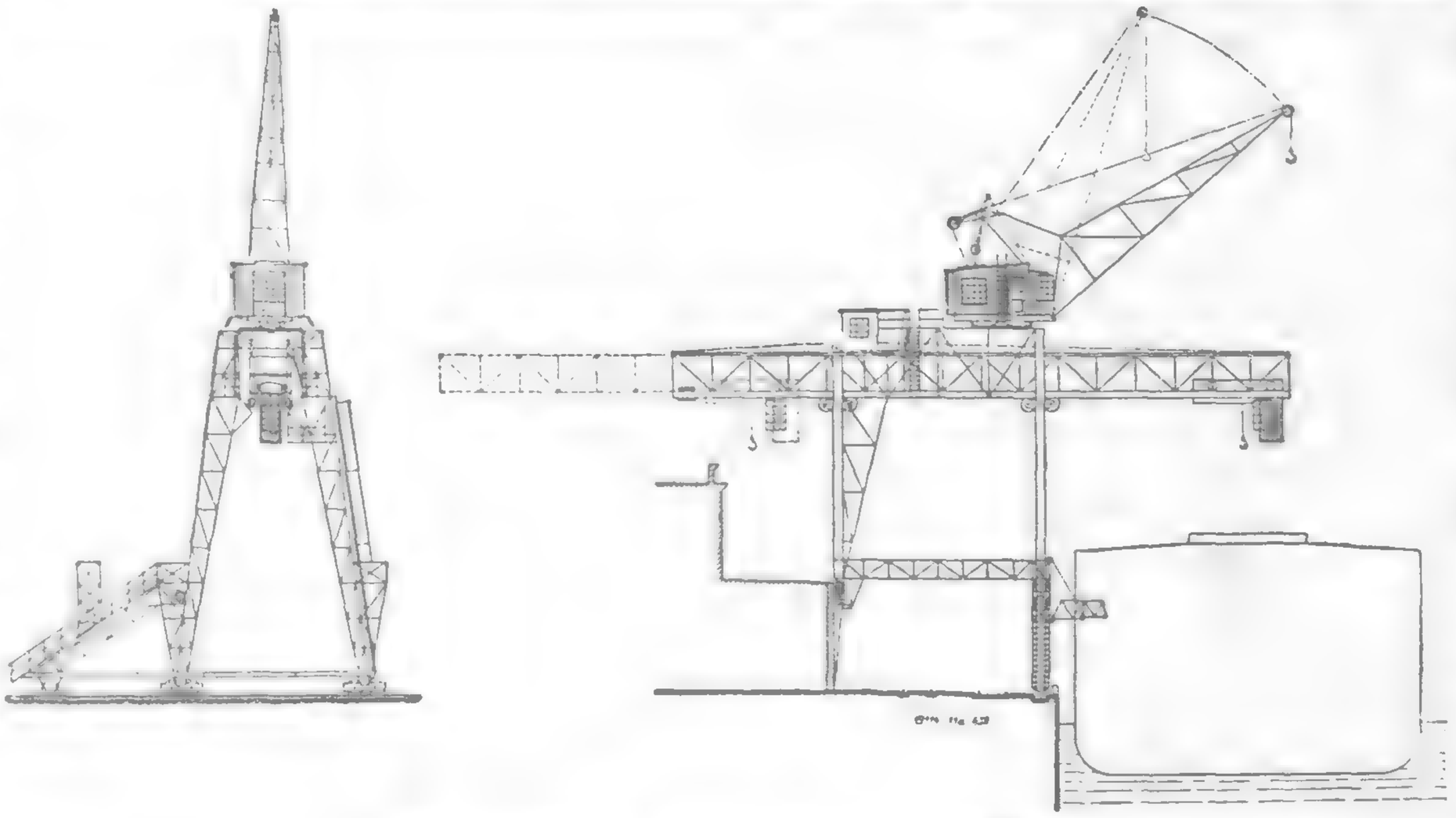


Fig. 3.—"Demag" Cranes at the Dairen Wharves

Mukden Power Station and Cooling Spray Pond

The New Light and Power Plant of Mukden

G. W. PHILLEO, Engineer, Andersen Meyer & Company Ltd., Shanghai

THE slow but steady growth of the electrical industry in the interior of China is nowhere better evidenced than in Mukden, the capital of Manchuria. In 1910 there was installed the first unit of the Mukden Government electric light plant, consisting of one General Electric Company turbine generator rated at 350 kw., 50 cycles, 2,300 volts. This was followed in 1913 by a second unit, this time rated at 500 kilowatts.

Manchuria, during this period and for several years later, was developing very slowly in an industrial way but about 1920 political changes gave an impetus to the growth of this section of China, and especially to the capital city, Mukden. In that year it was decided to change the frequency to the American standard of 60 cycles and a 1,500-kw., 60-cycle G-E turbine-generator was installed, followed in 1923 by a 2,500-kilowatt unit.

By 1927 all units were fully loaded and the problem of extension became acute, especially as there was no available space at the old site for a new plant. An entirely new site was therefore chosen and a new plant contracted for, consisting of one 5,000-kilowatt, 60-cycle unit with a steam pressure of 285 lbs. and superheat of 235 degrees, at the time the highest steam pressure and temperature in China. An effort was made to have this plant as economical as was possible for such a capacity.

In this new installation steam is generated in Heine Bent Tube boilers of 6,700 square feet each, three of which are installed, two to carry the turbine at full load and one boiler as spare. Harrington compartment type travelling grate stokers, 13 by 14, are used on the steam engine drive. Motor-driven forced draft fans and steam-engine-driven induced draft fans furnish the necessary draft. Combustion control is full automatic with Hagan control gear. This is the first automatic combustion control to be installed in China. The fans, as well as economizers, are of Green Economizer Company manufacture.

5,000 KW. General Electric Turbo-Generator at the Mukden Plant

The condensing equipment was supplied by the Worthington Company. As no adequate supply of cooling water was

available at the site or, in fact, practically in any site in Manchuria, a spray pond is utilized to provide the necessary cooling. All the circulating water spray ponds are very popular in Manchuria, especially as the extremely dry atmosphere makes them quite effective. As that district is afflicted with very severe and continuous dust storms, it was felt necessary that provision be made for the supply of cool and clean air to the generator, and the first General Electric generator air cooler in the interior of China is the answer.

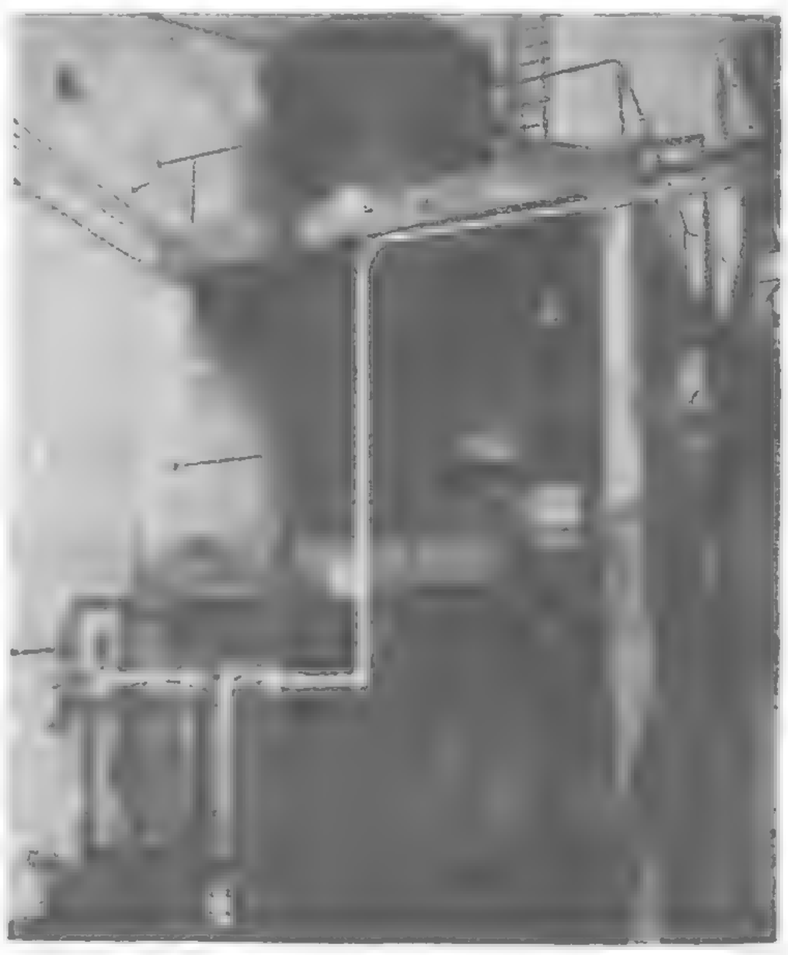
The turbine is arranged for two point extraction but as the plant is operating isolated at the present time, with steam-driven induced draft fans and steam boiler feed pump, exhaust steam is used for heating the feed water in an open type feed water heater. It is expected that later, when the ultimate 20,000 kilowatts are installed, extraction steam will be used for feed heating.

Power House Building of the Mukden Electric Light Works' New Plant

Generation is 6,600 volts, stepping down to 2,300-volt distribution in a substation. All switchgear in the main station is solenoid controlled.

The entire installation, which was started on March 10, 1929, and completed October 7 of that year, was under the supervision of Andersen, Meyer & Company's engineers. Operation was begun with a minimum of difficulty and at the time of this report, with an average daily load factor of 32 per cent. and the coal consumption was 2.2. lbs. per kilowatt-hour delivered to the switchboard, using a bituminous coal having a calorific value of 10,500 B.T.U. per pound as fired. One boiler has had no difficulty in carrying a load up to 3,000 kw. The saving of fuel as compared to the old plant is about 50 per cent. and the engineers have been particularly pleased with the smooth and economical operation.

Two 600 H.P. 300-lb. Pressure Heine Type Boilers with Harrington Travelling Grate Stokers, "Elesco" Superheaters



2,500 H.P. Cochrane Open Feed Water Heater and Two Worthington Feed Pumps

Worthington Condensing Plant

Demag Cranes in the Far East

(Continued from page 359).

trucks. The slewing crane has a radius of 40 ft. and uses an automatic grab holding 2.6 cu. yds.

The water-side support of the bridge shows sufficient clearance between its legs to let the crab pass through without any risk of collisions whatever the position of its slewing jib may be. The latter has a radius of 20 ft.

Owing to the appropriate choice of the working velocities and the very careful execution of all parts, the bridges present remarkably high transhipping performances. Their dependableness in operation also proved utterly irreproachable, for they have now been in commission since 1928 and 1929, respectively without the slightest disturbance or trouble having become apparent, although they are working almost continuously.

NEW COTTON MILL AT YINGKOU:—A group of Chinese capitalists at Yingkou are planning to build a cotton mill at Chingtuitzu, Yingkou, on the capital of $2,000,000, half to be paid up. A tract of 25,000 tsubo belonging to the Shengsheng Match Factory has been acquired for the factory site.

FUSHUN POWER HOUSE EXTENSION:—The new extension power house under construction at Fushun Collieries will be finished by the end of next September. Then, a minimum of 50,000 kilowatt will be generated which will raise the supply capacity of the Fushun Collieries to the highest in South Manchuria, Dairen alone excepted. The surplus power will be supplied to Mukden, Tiehling, Liaoyang and as far north as Kaiyuan and as far south as Anshan.

Electrically Driven Cotton Mills in China

The Dah Shing and Wah Shing Mill Equipment

Mr. W. L. Newmeyer, China representative of the Westinghouse International Electric Company, describing the 1,500 kw. turbine recently installed for the Dah Shing Cotton Spinning and Weaving Company's mill near Peiping, says that modern China is heroically undergoing the chaos and confusion usually accompanying the transition of a country from a monarchy to a republic.

However, in spite of all these difficulties and upheavals, industrial life goes on—and often to an amazing degree, even in regions where turmoil and strife are greatest.

In one of these troubled areas, Shih-Kia-Chwang, a small town 175 miles from Peiping (Pekin) along the Peiping-Hankow Railway, a new Westinghouse turbine was recently placed in operation at the Dah Shing Cotton Spinning and Weaving Company. This cotton mill is fairly large with 25,000 spindles and 400 looms and has been owned and completely supervised by Chinese for more than eight years.

A previous turbine installation had been made in 1922 when a Westinghouse 1,000-kw., 550-volt, three-phase, sixty-cycle unit was installed and placed in operation by Westinghouse engineers. Since then, this turbine under sole supervision and maintenance of Chinese engineers, has run practically continuously and provided the entire power supply for the mill. Twice a year, the casing of the turbine was lifted for inspection. However, no repairs or maintenance were necessary except for scraping lime deposits off the water gland casings and runners (because hard water from artesian wells as used).

With the gradual growth of the mill and the realization that absolute dependence upon one unit for the entire power supply was unwise, even though past experience had been so satisfactory, it was decided to add a new unit of 1,500 kw. A new Westinghouse unit with a 3,000 sq. ft. condenser and auxiliaries was ordered, with the specification that a Westinghouse engineer give technical advice and inspect and place in operation the new equipment, the installation work to be done directly under the supervision of the customer's engineers. This necessitated two trips; one in the Spring of 1929 to advise on arrangement, technical details and foundation plans, and another in August to inspect and check up the installation and place the unit in operation.

On the first trip, we were greatly impressed with the cleanliness, orderliness and general excellent maintenance of the plant. The staff proved exceptionally capable of planning and executing the erection. The maintenance engineer had constructed a small machine shop which was adequate for the necessary work on fittings, etc., which had to be done in the field. In addition to this, there was a small pattern shop and foundry, in which all the condenser circulating water pipe was cast, including ells, tees and special joints. The crucible for melting the iron was of particular interest—it was a home-made affair as the illustration shows. The results obtained clearly demonstrated the exceptional ability of the men in charge.

During the Fall inspection, it was found that the installation had been carefully made and that the alignment was as good as could be desired. An afternoon was spent in checking up, making slight alterations and putting on the turbine casing. The next day the turbine was turned over and a test run made. On the second day it was put on load and for the next three days it carried about 1,000 kw. continuously and has been operating regularly since.

The two men directly responsible for this creditable installation are Mr. H. T. Cheng, the electrical engineer and Mr. W. S. Wang, the plant superintendent. The credit for the exceedingly well operated and carefully maintained plant as a whole should go to Mr. S. T. Hsu, the general manager, Mr. F. S. Shih, the chief engineer, as well as to Mr. Cheng and Mr. Wang.

Turbine Room of the Dah Shing Cotton Mill, Showing 1,000 and 1,500 KW. Westinghouse Units

The Wah Shing Cotton Mills

Another important electrical installation in North China cotton mills is described by Mr. J. G. Jauch, the engineer of the A. E. G. office in Tientsin who directed the erection of the machinery. In describing the activities of the Wah Shing Cotton Spinning and Weaving Company, Mr. Jauch invites attention to the fact that the finer counts of yarn spun at the Tsingtao mill of this company have already found a market in South America. He says:

"Among the pioneer industrial establishments in China contributing to the economical reorganization of this country, and which have achieved a lasting success, the Wah Shing Cotton Spinning and Weaving Company with mills situated at Tienisin, Tsingtao, Tangshan

General View of Wah Shing Cotton Mill

and Weihwei respectively, occupy a prominent position. This Company was organized in 1914 by His Excellency Hsuehsi Chih Chi Chow.

The Tientsin Mill occupying an area of 330 sq. yards, was the first mill to be erected, commencing operations in July 1919 with 25,000 spindles to which another 2,000 were subsequently added. The mill is electrically driven. Two steam turbines, each rated for 1,000 kw. supply the necessary current for the plant. One small auxiliary Diesel plant with an AEG alternator was ordered last year.

Tsingtao Mill

The Tsingtao Mill, the second of the Wah Shing Cotton Mills, has been in operation for the last four years. Tsingtao is one of the most modern equipped ports in China for the accommodation of ocean-going steamers, and its industrial future is assured.

The plant erected covers an area of 350 mou (480 sq. yds.), The initial equipment was 20,000 spindles manufactured in the United States; 12,000 spindles were subsequently added, making a total of 32,000 spindles now in use. Originally, the mill was mechanically driven by vertical compound steam engines, with a relatively very high steam and coal consumption. The mill employs 2,500 hands. Last year, the Tsingtao Mill made an extension of 7,000 spindles of double frames for the spinning of fine counts and double-plied yarns. It spins up to 42 and 60 counts, which are rarely produced in China. The yarn of the Tsingtao Mill is in demand all over China and lately several bales were shipped to South America. The mechanical drive has now been replaced by an electrical drive, all motors for group and individual drives being ordered from the AEG, as follows:

A.E.G. Line Shafting Drives

Wah Shing Cotton Mill
Winding Machine with A.E.G. Geared Motor Drive

Wah Shing Cotton Mill: Weaving Shed with Geared Motor Driven Looms

3 AEG slip-ring motors, 550 volts, 50 cycles, 375 r.p.m., 270 H.P. each.
1 motor as above, but with an output of 150 H.P.
9 motor as above, „ „ „ „ „ 110 H.P.
3 motor as above, „ „ „ „ „ 48 H.P.

The above motors drive the existing line shafting. For Preparatory Machines

4 squirrel cage motors, 12 H.P., 1455 r.p.m.
8 „ „ „ 5.5 „
10 „ „ „ 10 „

All motors are equipped with ironclad switch cases with automatic features, or star-delta switches respectively. The large slip-ring motors are also equipped with a brush lifting device operated *via* chain drive from oil-immersed starters.

(*Continued on page 395*).

The "Chu Kiang": A Ryan Brougham Flying in the Aviation Division of the Commander-in-Chief of the 8th Route Army of Nationalist Government of China

History of the Ryan Aircraft Corporation

and Col. Charles Lindberg's Spirit of St. Louis

By G. W. BROPHY

The manufacturing activities of the Ryan Aircraft Corporation, a subsidiary of the Detroit Aircraft Corporation, date back to 1922 when the Ryan Airlines was hopping passengers and rebuilding war planes in San Diego, California. During this period a number of old Standards were remodeled into cabin planes, which were the forerunner of the present elaborate Ryan Brougham which is known in every country in the world.

In that year B. F. Mahoney took a course in flight instruction from T. C. Ryan, who was the president of the organization. Mr. Mahoney invested money in the business and several additional planes were purchased and rebuilding was gone into on a larger scale. In March of 1925, the Ryan Airlines started the first daily commercial passenger service in the United States between San Diego and Los Angeles. Due to the difficulty of purchasing planes which could be operated safely with a heavy pay load, the organization decided to build its own planes.

The Most Famous Ryan, yet scarcely comparable to the 1930 Models

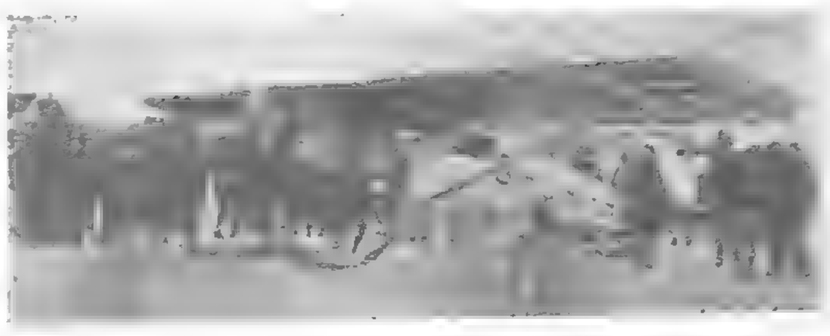
These first planes known as the "M-1s," a high wing open cockpit monoplane, were the first of this type seen in the west. The first order booked was for seven planes from the Pacific Air Transport Company operating in the Northwest States. Several of these first Ryan monoplanes are still operating successfully. Ryan No. 7 was entered in the first Mile-High air meet at Denver and won all the main events. It was also entered in the second annual Ford reliability tour of the same year.

In September of 1926 increased sales and production required additional space, and the plant was moved to an old fish cannery on the water front adjoining what was later to be Lindbergh Field. T. C. Ryan at this time sold his interest to B. F. Mahoney but was retained as general manager. Twenty-nine of these open cockpit models, known as the M-1, and the later improved model, known as the M-2s, were constructed and sold during this period.

On March 1, 1927, Charles A. Lindberg arrived at the San Diego plant after previous correspondence in regard to building his Trans-Atlantic plane. As Colonel Lindbergh insisted on a cabin job, and officials of the company saw the trend was toward closed cabin construction, practically the entire facilities of the plant were turned toward building the "Spirit of St. Louis" in record time. In sixty days the ship was

Hauling a Shipment of 11 Ryans Through the Streets of Shanghai, Preparatory to Setting up for Air Line Operation between Canton and Hankow

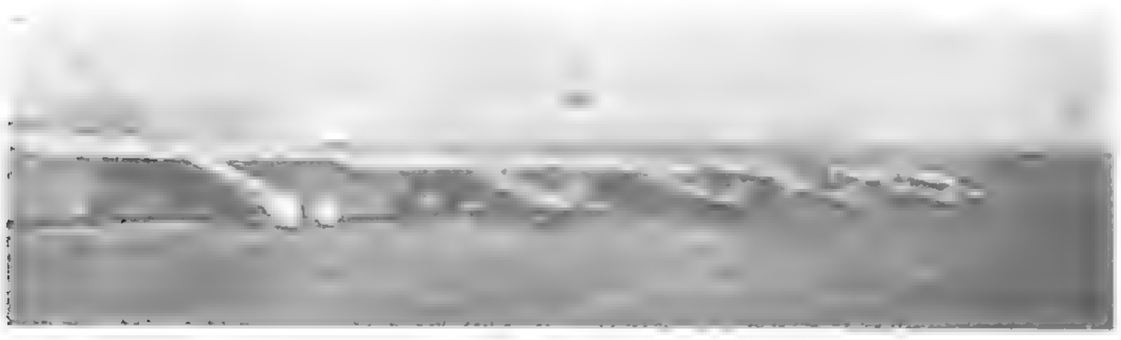
Hundreds of Miles from Supply and Service this Ryan is in Daily Operation in New Guinea



This is one of the Ryans used in the Yukon gold mining region where the ship is operated at temperatures ranging from 30 to 50 degrees below zero

designed, stressed and built. The "Spirit of St. Louis" was the experimental ship of the B-1 class Ryan. Some of the same engineers who designed and build the "Spirit of St. Louis" are still with the Ryan organization. Shortly before the building of the "Spirit of St. Louis" T. C. Ryan had completely severed his connections with the Company, which was renamed the B. F. Mahoney Aircraft Corporation, shortly after the completion of Lindbergh's flight.

Following the flight of the "St. Louis," the Company was swamped with orders for these famous Ryan cabin monoplanes,



Showing some of the twelve Ryans purchased by the Pickwick Latin-American Airways for use between Los Angeles, Mexico, Guatemala and San Salvador. The ships must pass over mountain ranges 12,000 feet high and take-off from airports 7,000 feet above sea level

which at that time were a distinct advance over anything in the field, in addition to having the invaluable prestige of Lindbergh's flight behind it. As the Company was not ready for quantity production of the new ship, it was faced with the situation of being swamped with orders and at the same time not having capital or facilities to produce planes to meet them.

On January 1, 1928, the B. F. Mahoney Aircraft Corporation was taken over by the Mahoney-Ryan Aircraft Corporation of Missouri and among the directors were several of the original backers of Lindbergh, including P. D. C. Ball, St. Louis Capitalist and well known as the owner of the St. Louis "Browns," Harold M.

Col. Miguel Granados and Lieut. Carlos Merlen in St. Louis after completion of the first leg of their good-will flight from Guatemala City to Washington, D. C., and return through Mexico City. The flight covered a distance of 5,200 miles and the ship did not need the slightest attention outside of routine lubrication

Bixby of the State National Bank of St. Louis, and Harry M. Knight of the firm, Knight, Dysart & Gamble, investment brokers.

At that time, Mr. John C. Nulsen was appointed vice-president and general manager. It was Mr. Nulsen who for the first time in the history of the organization introduced an efficient production system, and in addition organized a world-wide system of sales distribution. It was under Mr. Nulsen's direction that a dozen improvements were made which brought the B-1 model to a state of great popularity.

Within a month production increased from four to sixteen ships a month with practically no increase in the payroll and very little increase in equipment. Improvements were made, parts were made purposely interchangeable and a progressive assembly line system of production was started. Production in the abandoned cannery took the lead among all builders of Wright Whirlwind cabin planes with the overhead and production costs probably the lowest of any plant producing a plane of this type.

For the first time the Company was able to give reasonable delivery on sisterships of the famous "Spirit of St. Louis," but with every inch of space used to capacity and every known method used

Twenty of these "Corsairs" were recently sold to the Chinese Government.

to speed up production already in effect, the plant had reached its absolute capacity.

The new management foresaw that there was an increasing demand for an elaborately equipped cabin plane suitable for the use of large business corporations, private operation and for the use of commercial operating companies. With the idea of producing a ship especially designed for short take-offs and landings, with a high speed and a degree of stability hitherto unknown, the new management started the construction of a modern aircraft plant at Lambert Field, Near St. Louis. With the opening of this plant in November 1928, the Company sold its holdings in San Diego which included a flying school and commercial service which had been managed by the Ryan Organization for many years.

The New plant was especially designed for the production of the new B-3 and B-5 models, which were placed in production late in 1928. The latter ship was especially designed for the J-6 Wright Whirlwind 300 Horsepower motor, and with the many improvements which were placed upon it, it soon became one of the most popular cabin planes in the field. The new plant was designed to extend the economies which the progressive assembly line system of production, introduced in the old plant by Mr. Nulsen, had effected.

In May, 1929, the Ryan Aircraft Corporation became a division of the Detroit Aircraft Corporation and is now operating as a unit of this large group.

During this period the Company had been far-sighted enough to build up a world-wide distributing organization which is probably the best in the larger cabin plane class.

The Ryan is probably better known in foreign countries than any other American plane made, and Ryans are being successfully operated in the four corners of the world. Eleven RYANS have been sold in China, five of which are being used to establish the first air transport line in that country, and other ships are being operated in New Guinea, Japan, Australia, New Zealand, England, Italy, Guatemala, Mexico and Canada. During 1928 export business formed approximately 20 per cent of the total sales of the Ryan Aircraft Corporation. This hold on foreign markets is particularly valuable at the present time, as many countries are just ready for a huge expansion of aeronautical activities.

Behind the engineering research and accomplishments of Ryan Aircraft Corporation stands Detroit Aircraft Corporation, making available to its subsidiary and affiliated companies technical and management co-operation and financial resource beyond those which would be at the command of any independent company.

Detroit Aircraft Corporation comprises the following subsidiaries :

Aircraft Development Corporation, (Metal-clad Dirigibles)
Aircraft Parts Company, (Aircraft production tools and machines)
Blackburn Aircraft Corporation, (Commercial and Military airplanes)
Eastman Aircraft Corporation, (Flying boats and amphibians)
Gliders, Incorporated, (Gliders)
Grosse Ile, Airport Inc. (Airport at Detroit, Mich)
Lockheed Aircraft Corporation (Monoplanes)
Marine Aircraft Corporation, (Metal Clad Flying boats)
Parks Air College, Inc. (Flying Schools)
Parks Aircraft Corporation, (Commercial and Training Biplanes)
Ryan Aircraft Corporation, (Cabin monoplanes)

Detroit Aircraft Corporation enjoys the continued initiative and courage of pioneer aeronautical engineers and the enterprise and organization genius of men having extensive manufacturing experience in "Detroit" methods of production. The Board of Directors and Executive Staff are applying these methods to aircraft manufacture as far as practicable, effecting continual improvement of design and refinement of detail with minimum interruption and expense.

National Equipment Corporation

A consolidation of the following six important construction equipment manufacturers under the name of the NATIONAL EQUIPMENT CORPORATION, has been announced from its general headquarters at Milwaukee, Wisconsin :

Koehring Company
Insley Manufacturing Company
The T. L. Smith Company
The Parsons Company
C. H. & E. Manufacturing Company
Kwik-Mix Concrete Mixer Company.

The merger makes possible close co-operation in engineering design, standardization of production methods, warehousing, service, and effects other economies whereby increased value to the customer can be delivered.

KOEHRING DIVISION : Koehring Company was organized in 1907. It manufactures a broad line of concrete mixers, paving machines, power shovels, cranes, draglines and dumptors. Its growth has been rapid, its annual sales being well over $6,000,000. It has a national reputation as a leader in the manufacture of paving mixers.

Philip A. Koehring, General Manager of Koehring Company and President of the National Equipment Corporation is recognized as one of the outstanding leaders of the construction industry. He has been president of the National Association of Concrete Mixer Manufacturers, twice president of the Milwaukee Association of Commerce and active in other civic and business affairs of both his home city and the nation.

INSLEY DIVISION : The Insley Manufacturing Company, located in Indianapolis, Indiana, has been developed from a steel fabricating and jobbing business. Insley steel hoisting towers and chutes for concrete pouring and placing have made the company known nationally. Four years ago a one-half cubic yard shovel and crane was added to the line, which has proven very successful. This shovel is complementary to the line of larger machines made by the Koehring Division.

T. L. SMITH DIVISION : The T. L. Smith Company, founded in 1900, is one of the largest manufacturers of concrete mixers in the world. Smith mixers have produced the concrete for such structures as the Muscle Shoals Dam, General Motors Building, etc., and the T. L. Smith Company has manufactured the largest mixers in the history of the world, capable of mixing four tons of concrete in one batch.

PARSONS DIVISION : The Parsons Company manufactures the Parsons trench excavators used in the digging of trenches for oil pipe lines, underground telephone and telegraph cables, sewers, gas and water mains, etc.

C. H. & E. DIVISION : The C. H. & E. Manufacturing Company, founded in Milwaukee in 1909, manufactures pumps, hoisting machinery, saw rigs, material elevators and mortar mixers. This equipment is used extensively in building operations by contractors throughout the United States and in many foreign countries. During the World War the firm's pumps were used over-seas for draining trenches.

KWIK-MIX DIVISION: The Kwik-Mix Concrete Mixer Company produces a line of small tilting concrete mixers, mortar mixers and plaster mixers. These products supplement the building mixers manufactured by the Koehring and Smith Divisions.

While headquarters of the National Equipment Corporation are located in Milwaukee, foreign sales are directed from the office of the Export Department, located at Room 579, 50 Church Street, New York City, U.S.A.

Imperial Railway to Have Diesel Boats

The Imperial Railway Department of Japan will build two 4,000 ton Diesel engined ferry boats for the Shimonoseki-Fusan Service. Negotiations for their construction are being conducted in Tokyo with various shipbuilding companies. In view of the fact that these are the first Diesel ferry boats to be built by the Government Railway Department, much interest is being created as to the type of engines to be adopted.

JAPAN MAY BUILD FOREIGN WARSHIPS : The Portuguese Government has recently opened negotiations with Mitsui, Mitsubishi, and Kawasaki Dockyards through the Foreign Office for the construction of a 2,000 ton destroyer. The Mexican Government has also opened negotiations with Japanese builders for building four large special service ships.

O.S.K. New South American Motor Liner "Rio de Janeiro Maru"

In the May and June issues of *The Far Eastern Review* appeared very complete descriptions of the new motorship services of the Osaka Shosen Kaisha. The development of the South American business of this company has been one of the most significant trends of world traffic, indicating as it does, the determination of Japan to build up her commerce in countries where her people are welcome. It was only a few years ago that the O.S.K. launched out on a new program for the improvement of this service by constructing three 7,000 ton motorships, the *Santos Maru*, *La Plata Maru* and the *Montevideo Maru* to handle the increasing trade. These vessels proved so popular that the O.S.K. decided to add two new 10,000 ton motor ships that would provide a regular monthly service between Japan and the principal South American ports.

The order for both of these vessels was placed with the Mitsubishi Shipbuilding and Engineering Company, and their construction carried out in the Nagasaki Works of the company. These two new motorships, the *Buenos Aires Maru* and the *Rio de Janeiro Maru* are identical in type and fittings. A full description of the *Buenos Aires Maru* appeared in the May issue of *The Far Eastern Review*, while the engines of the *Rio de Janeiro Maru* were illustrated in the June number. This last vessel has since been handed over by the constructors to the owners and left on her maiden trip to South America early in June, thus marking the completion of the O.S.K.'s new program for this service. Where formerly, the schedule was eleven trips a year, the addition of the *Rio de Janeiro Maru* enables the O.S.K. to maintain a full monthly service. This is to be supplemented by occasional extra runs of the *Hawaii Maru*.

The particulars of the *Rio de Janeiro Maru* follow :

Length over all	482-ft. 0-in.
Length b.p.	460-ft. 0-in.
Breadth moulded	62-ft. 0-in.
Depth moulded	39-ft. 6-in.
Draught, loaded	26-ft. 0-in.
Tonnage :	
groos	9,626
dead weight	8,234
Passenger accommodations :	
1st class..	60
3rd class	1,076

(Continued on page 399)

"Rio de Janeiro Maru," O.S.K.'s South American Liner, 9,626 Tons Gross. Built at the Nagasaki Yard of the Mitsubishi Shipbuilding and Engineering Co., Equipped with Two Sets of Two Stroke, Single Acting Sulzer Diesel Engines, each Motor Developing 3,000 B.H.P.

Panoramic View of the Mitsui Tama Dockyard, March, 1930

Shipping and Shipbuilding Activities of the Mitsui Bussan Kaisha

THE story of the House of Mitsui has been told so often that it seems unnecessary at this time to again review the activities of a concern whose origins are lost in the mists of history.* A century before Charles Martel swept back the Moslem hordes at Tours in 732 A.D., the Mitsuis were prominent in the affairs of Japan. When the Crusaders were battling before the walls of Jerusalem in the 12th century, the Mitsui family had entered upon its career of financial and commercial usefulness. The great merchant corporations of the 16th and 17th century, the East India Company, the Spanish trading monopolies that absorbed the wealth of the Indies, of Mexico and Peru, the gentlemen adventurers who conquered and annexed other corners of the world for the furtherance of trade, lived their short life and faded into oblivion. The Mitsui, a Japanese commercial concern, almost unknown outside its own country, has taken the place once occupied by these princely houses. For thirteen hundred years the family has been prosperous and conspicuously rich since Henry VIII. sat on the throne of England. When Hachirobei Mitsui, head of the House in 1694 died, he left a will for the guidance of his family and the management of the estate, which remains to-day as the code of the Mitsuis, a constitution based on fair-dealing, probity and humanitarianism, that has united the eleven branches of the Family and enabled it to survive the storms and vississitudes of politics, wars, earthquakes and business crises and emerge into its present enviable position in world commerce.

It is difficult to ascertain where the Mitsui influence begins and ends in Japan. We find them operating a private bank whose paid up capital is Yen. 60,000,000 with deposits of over Yen. 650,000,000. They have their own insurance and trust organizations, their merchandizing companies, textile mills; fishing and food industries, machine shops, engineering and chemical plants, shipping lines and shipbuilding yards, mining, smelting and metal refining, land transport, light, power and traction, buildings and warehouses. Nearly a quarter of all the goods stored in Japan are in the warehouses of the Toshin Soko, the Mitsui warehousing subsidiary. The Mitsuis control the world's greatest trading organization. A quarter of the foreign trade of the Japanese Empire passes through its hands. The Mitsui agents outnumber the embassies and consulates of the Empire. They are the business scouts of Japan, to be found in all parts of the world, seeking the raw materials for the mills which give employment and life to the people of their country and opening up markets for the products of their labor.

* The House of Mitsui, *Far Eastern Review*, July, 1925.

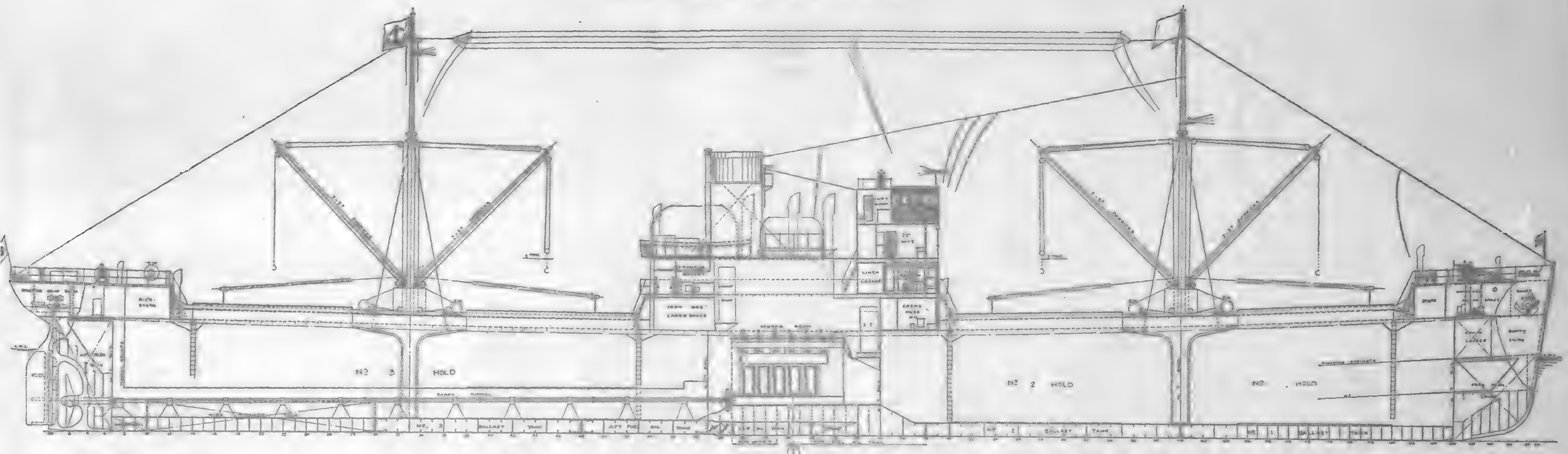
Machine Shop

Boiler Shop

Mitsui Tama Dockyard

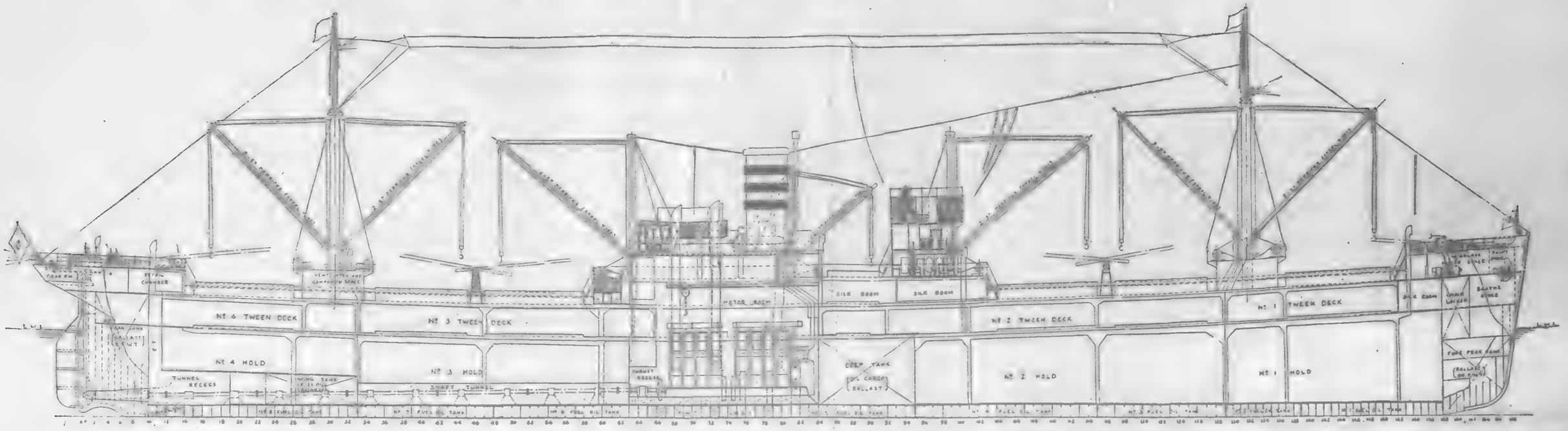
M.S. RONSAN MARU GENERAL ARRANGEMENT

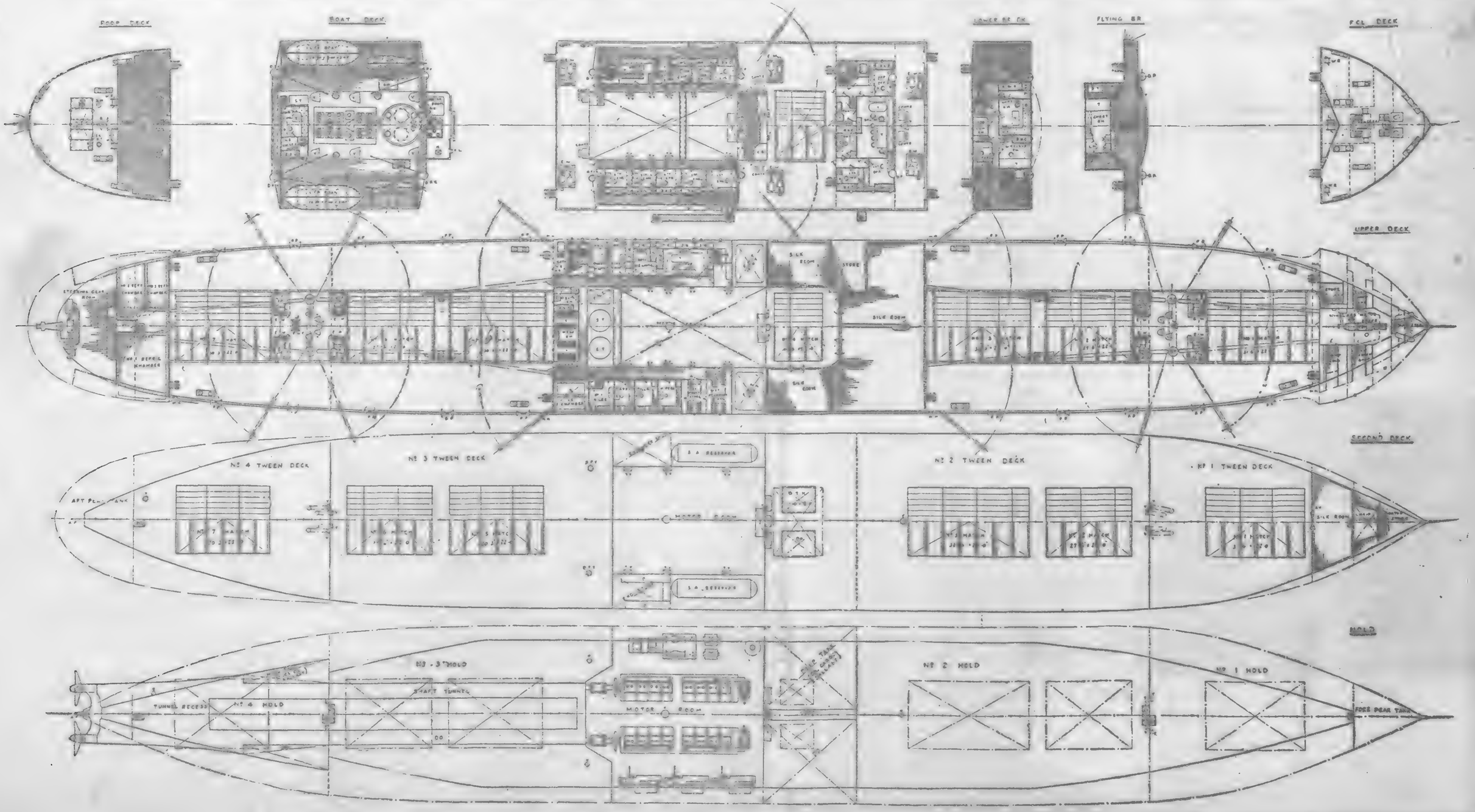
325-ft. by 46-ft.-6-in. by 21-ft.-6-in.



M. S. HAKONESAN MARU GENERAL ARRANGEMENT

435-ft. by 56-ft.-6-in. by 33-ft. Load Draft 26-ft.-1.97-in.





Panoramic View of the Mitsui Tama Dockyard

(*Continued on next page*)

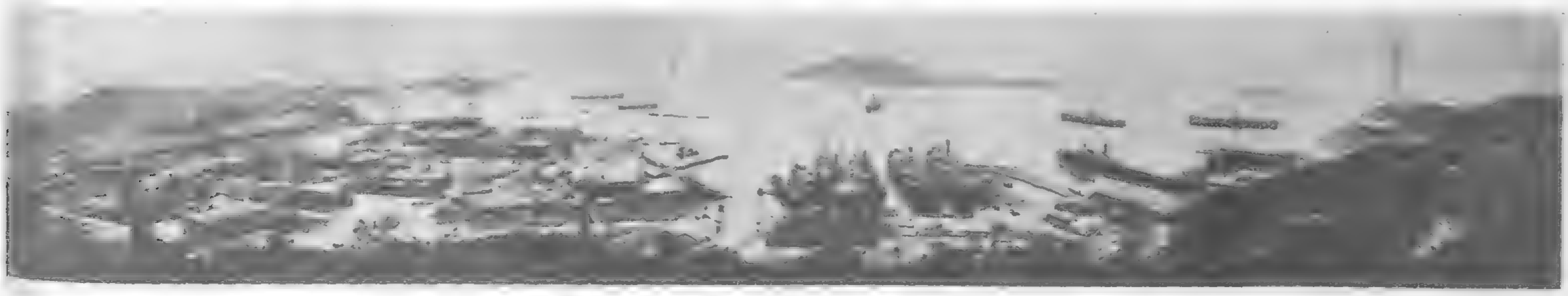
We have published in past issues of the *Far Eastern Review* several articles on the secret of Japan's commercial success. This secret, reduced to its simplest formula, is co-operation and business organization, methods which are now being adopted by Big Business all over the world in the effort to survive competition. The Mitsui organization in the cotton industry originated the system which has since been followed by all other textile interests in Japan and carried them to success in expanding their export markets. We find them buying the raw cotton in the fields of the producing countries, financing the transactions in their own banks, insuring the cargo in their own companies ; transporting it to Japan in their own steamships ; spinning and weaving it in their own mills and exporting the finished yarn and cloth, financed, insured and transported by their own subsidiaries and sold by their own organization. It has been impossible for any other country to create a more complete cycle of commercial operations. The greatest spinning company in Japan, the Kanegafuchi, owes its success largely to the support of the Mitsuis. Its record for efficiency is the highest tribute to the wisdom of co-operation.

The House of Mitsui is now ruled by the senior Baron Hachiroyemon, fourteenth Baron Mitsui, who as President of the Mitsui Gomei Kaisha, or holding company, is the central figure of the organization. His Prime Minister of Trade is Baron Takuma Dan who as Director General of the Gomei Kaisha, supervises all the activities of the Mitsui interests. Baron Dan is the leader of Big Business in Japan, and like his prototype in the United States, the late Judge Gary, realizes that the first concern of Big Business is not profits but the welfare and contentment of the workers. The responsibilities of the House of Mitsui to the people of Japan are greater than those of any similar organization in any other country. Japan's wealth consists largely of the labor of a people denied the right to emigrate and settle in other countries. The solution of Japan's population problem can be found only in industrialization, the creating of opportunities within their own country, enabling the workers to earn the wage to purchase the food to keep them alive. In this struggle for existence, amongst a people increasing at the rate of nearly a million a year, there is no room for predatory capital, for selfish exploitation or grinding down the working classes. The House of Mitsui, together with the other five great Japanese family organizations dominating the trade and industry of the Empire, have the well-being and happiness of the nation in their keeping and it is a testimonial to their broad, paternalistic and liberal policies, that Japan has risen to her present proud position in world commerce, Baron Dan is ably assisted in the management

Shipbuilding Slips

No. 1 Dry Dock

Mitsui Tama Dockyard



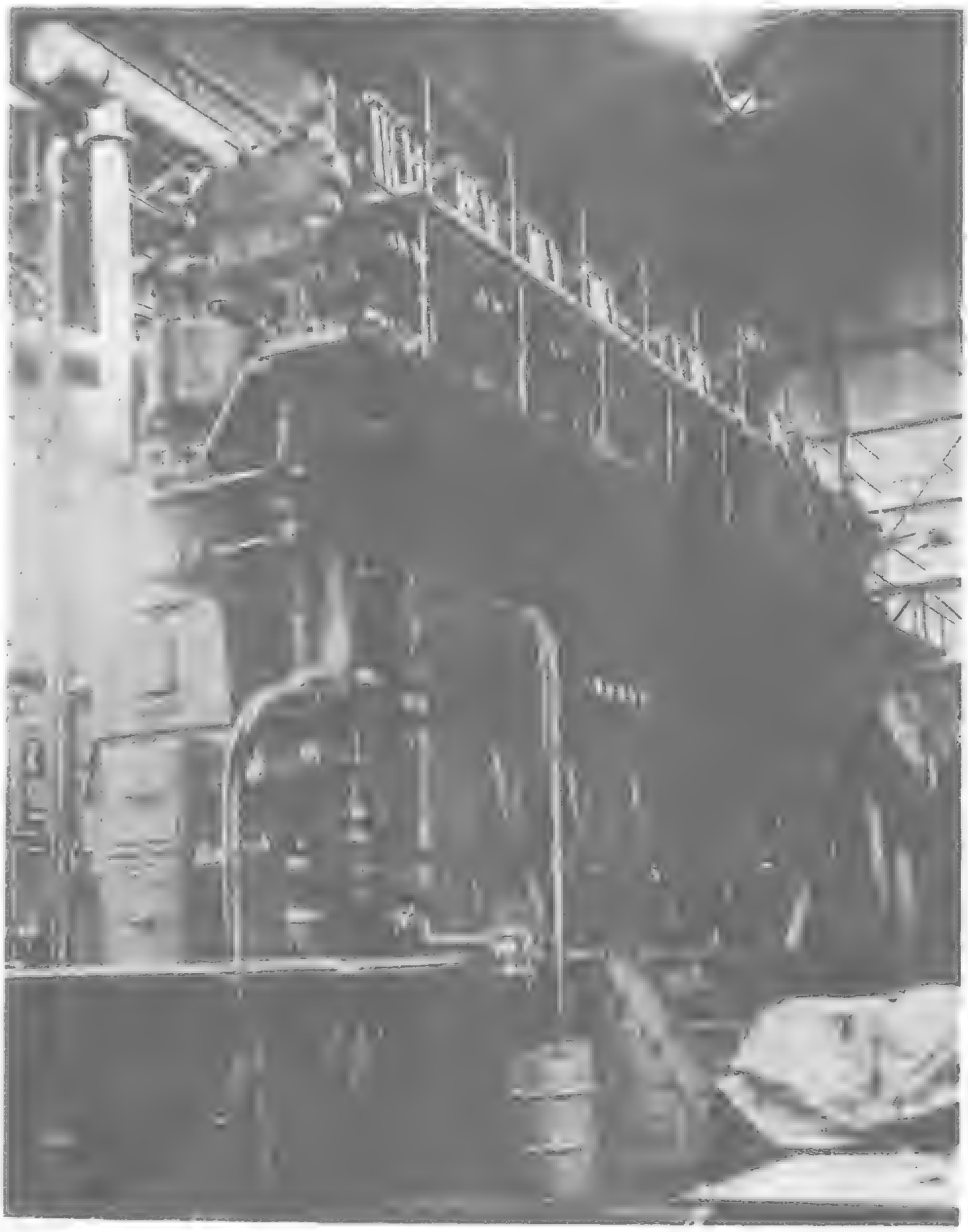
Mitsui Tama Dockyard from the Hills

Panoramic View of the Mitsui Tama Dockyard

of the Mitsui holding company by two Managing Directors, Mr. N. Ariga and Mr. K. Fukui, men who typify all that is best in Japanese legal and administrative methods. There are two other directors, Mr. T. Sakai and Mr. Oshima.

As early as 1700, when Nagasaki was the only open port in Japan, the Mitsuis had their branch establishment there, importing goods from Europe and exporting the products of Japan. From this beginning, has grown the present great trading organization known in Japan and throughout the Far East as the Mitsui Bussan Kaisha and in Europe and America as Mitsui & Company, Ltd. With a capital of Yen 100,000,000, the Mitsui Bussan Kaisha handle 19 per cent. of Japan's import trade and 23 per cent. of her exports. This does not include the enormous quantities of raw cotton and yarn handled by its subsidiary, the Toyo Menka (Oriental Cotton Trading Company), one of the strongest factors in the international cotton trade.

The Mitsui Bussan Kaisha has ten departments, supervised by experts in their respective lines; sugar, coal, machinery, metal and metal goods, cereals and fertilizers, timber, silk, shipping, shipbuilding and general merchandise. This organization is headed by Mr. Murinosuki Mitsui and Mr. Genyemon Mitsui, as representative directors, but the active supervision of these world-wide activities comes under a group of four managing directors, headed by Mr. Y. Yasukawa, a name to conjure with in international trade. His associates are Mr. K. Nanjo, Mr. M. Kobayashi and Mr. Kawamura. In addition, there are seven other directors. Many of the foremost leaders of Japanese finance and commerce and industry are graduates of the Mitsui organization, resigning to accept the direction of other private enterprises or subsidiaries. The Mitsuis control a multitude of joint share companies which call for representative of their interests on the directorate or in the management.



Mitsui-Burmeister & Wain, 5,600 B.H.P. Diesel Engine Made at the Tama Dockyard for the M.B.K. Motorship "Hakonesan Maru"

Immediately after its incorporation, the M.B.K. purchased several British steamers and chartered others in order to create a fleet to transport coal from the company's mines to the consuming markets of the Far East. This department has gradually developed until it now owns a fleet of thirty-three cargo vessels with an aggregate of 178,250 d.w. tons and operates under charter another 200,000 tons; a total of nearly four hundred thousand tons of shipping under one management.

The larger N.Y.K. and O.S.K. passenger liners are perhaps more widely known to the travelling public, but their main services are restricted to subsidized mail schedules,

Panoramic View of the Mitsui Tama Dockyard

while the Mitsui cargo fleet carries the flag of the Rising Sun into all the out of the way ports of the world seeking and loading the raw materials which keep the wheels of industry revolving in Japan.

The M.B.K. Fleet is now composed of the following 33 vessels :

Name of Vessel	D/W. Tons
M. S. *Hakubasan Maru*	9,713
,, *Hakonesan Maru*	9,671
S. S. *Iwatesan Maru*	8,982
,, *Ibukisan Maru*	8,903
,, *Hoyeisan Maru*	8,813
,, *Kinkasan Maru*	8,205
M. S. *Shikisan Maru*	8,100
S. S. *Azumasan Maru*	7,285
,, *Mandasan Maru*	7,240
,, *Akibasan Maru*	7,151
M. S. *Akagisan Maru*	6,981
S. S. *Atagosan Maru*	6,600
,, *Tone Maru*	6,422
,, *Kiso Maru*	6,404
,, *Amagisan Maru*	6,225
,, *Ikomasan Maru*	5,002
,, *Miikesan Maru*	5,002
,, *Harunasan Maru*	4,862
,, *Kachosan Maru*	3,878
,, *Kasagisan Maru*	3,877
,, *Katsuragisan Maru*	3,875
,, *Kasugasan Maru*	3,874
S. S. *Sanka Maru*	3,800
,, *Sanjin Maru*	3,790
M. S. *Koyasan Maru*	3,203
,, *Kuramasan Maru*	3,202
,, *Takamisan Maru*	3,145
,, *Tatsutasan Maru*	3,144
S. S. *Rokkosan Maru*	3,120
,, *Takaosan Maru*	3,035
,, *Santen Maru*	1,890
,, *Sancho Maru*	1,882
,, *Sanko Maru*	946
Total 33 vessels	178,222

With this splendid fleet of its own to direct, the M.B.K. Shipping Department has its headquarters in Kobe, (the shipping center of Japan) where it takes the lead in the activities of the Kobe Shipping Exchange, organized in 1921 under the initiative of the M.B.K. Aside from its activities as ship-brokers, and cargo-carriers, the M.B.K. Shipping Department has carried out extensive experiments and investigations in improving the efficiency of its vessels. The paper on the "Comparative Economic Aspects of Oil-Burning Steamships and Internal Combustion Motor Ships" read before the World Engineering Congress by Mr. T. Kawamura, Managing Director of the M.B.K. in charge of shipping (reproduced in the May issue of *The Far Eastern Review*) is evidence of the interest taken by this company in advancing the efficiency of Japan's mercantile marine. In fact, the paper is the first important contribution to a subject of vital interest to the entire shipping world.

M.B.K. Motorship "Hakonesan Maru" Built at the Mitsui Tama Dockyard, 9,671 D.W. Tons

Coming from a Japanese source, this contribution is indicative of the growing importance of Japan in world engineering and the determination of its shipowners to keep abreast other more advanced countries. This comparison, carried out by two M.B.K. cargo ships specially designed and constructed at their own shipbuilding yards, showed by actual working results over a period of months, the superiority of the motor ship over the oil-burning steamship.

The M.B.K. is following up these experiments by making every effort to improve their services and provide the shipper with the most superior type of cargo vessels and, although many vessels in the fleet are still propelled by oil burning engines, the company is adding from time to time new tonnage to cope with the increase in business and to replace its older vessels. It is, of course, difficult to forecast the Company's shipping requirements many years ahead, but the present M.B.K. program provides for the addition of approximately 12,000 tons annually to maintain its fleet in an efficient condition.

Typical of the new motor cargo vessels being added to the M.B.K. fleet is the *Hakonesan Maru*, built last year at the Tama Shipyards of the M.B.K. The essential particulars of this vessel are as follows:

Dimensions: Length; 435 feet; Breadth 56½ feet; Depth 33 feet; Draft at full load, 26 ft. 2-inches.

Tonnage: Gross 6,673; Dead Weight 9,761; Under Deck tonnage 5,922; Net Register, 4,086.47; No. of Holds, 5.

Main Engines: Two Mitsui Burmeister & Wain 8-Cylinder, 4-cycle, single acting, forced lubrication cross-head type, 135 r.p.m.

Diesel Engines: Indicated Horse Power, 5,600.

Speed: Service 14 knots. This ship is the speediest amongst the Japanese cargo motorships.

Loading Equipment: Fore and Main Masts as well as Derrick Posts are stayless, affording great facility in loading and discharging deck cargo.

Other Equipment: Twelve 5-ton derricks fitted with electric winches; 60 ton capacity.

Refrigerating Chamber: A 370-ton capacity Silk Room in the Bridge Space.

Fuel and Lubricating Oil Consumption: 17 tons only per day.

Two other new vessels have recently been built at the Mitsui Tama Yards, the M. S. *Ronsan Maru* for the new fleet of the Dairen Kisen Kaisha and the collier S.S. *Sorachi Maru.* The particulars of these vessels follow:—

"Ronsan Maru"

Dimensions: Length B.P., 325 feet; Breadth 46 ft. 6 inches; Depth moulded 21 feet, 6 inches; Draft at full load, 17 feet, 11.06 inches.

Tonnage: Gross 2,733.30; Dead Weight 4,150.00; Under Deck tonnage 2,248.14; Net Register 1,556.08, No. of Holds. 3.

Main Engines: One Mitsui-B. & W. Type 6-cylinder, 4-cycle single acting forced lubricated trunk type. Max. B.H.P. 1,400; Rev. 140; Cyl. diameter, 550 min. Stroke

VESSELS BUILT AT THE MITSUI TAMA DOCKYARD

S.S. "Taiyei Maru," 5,000 D.W. Tons, Speed 11 Knots; Coal Consumption About 20 Tons in 24 Hours

S.S. "Katsuragisan Maru," 3,900 D.W. Tons, Speed 10½ Knots; Coal Consumption About 17 Tons in 24 Hours

Inland Sea S.S. "Midori Maru"

Collier "Sorachi Maru," Launched on May 31, 1930, at the Tama Dockyard

1,000 M; Sea Going Speed, 10½ knots; Max. Trial Speed, 12.62 Knots. Classification, 100 A1.

"Sorachi Maru"

Dimensions: Length 350 feet; Breadth 49 feet; Depth moulded 27 feet, 9 inches; Draft at Full head, 22 feet, 11.74 inches.

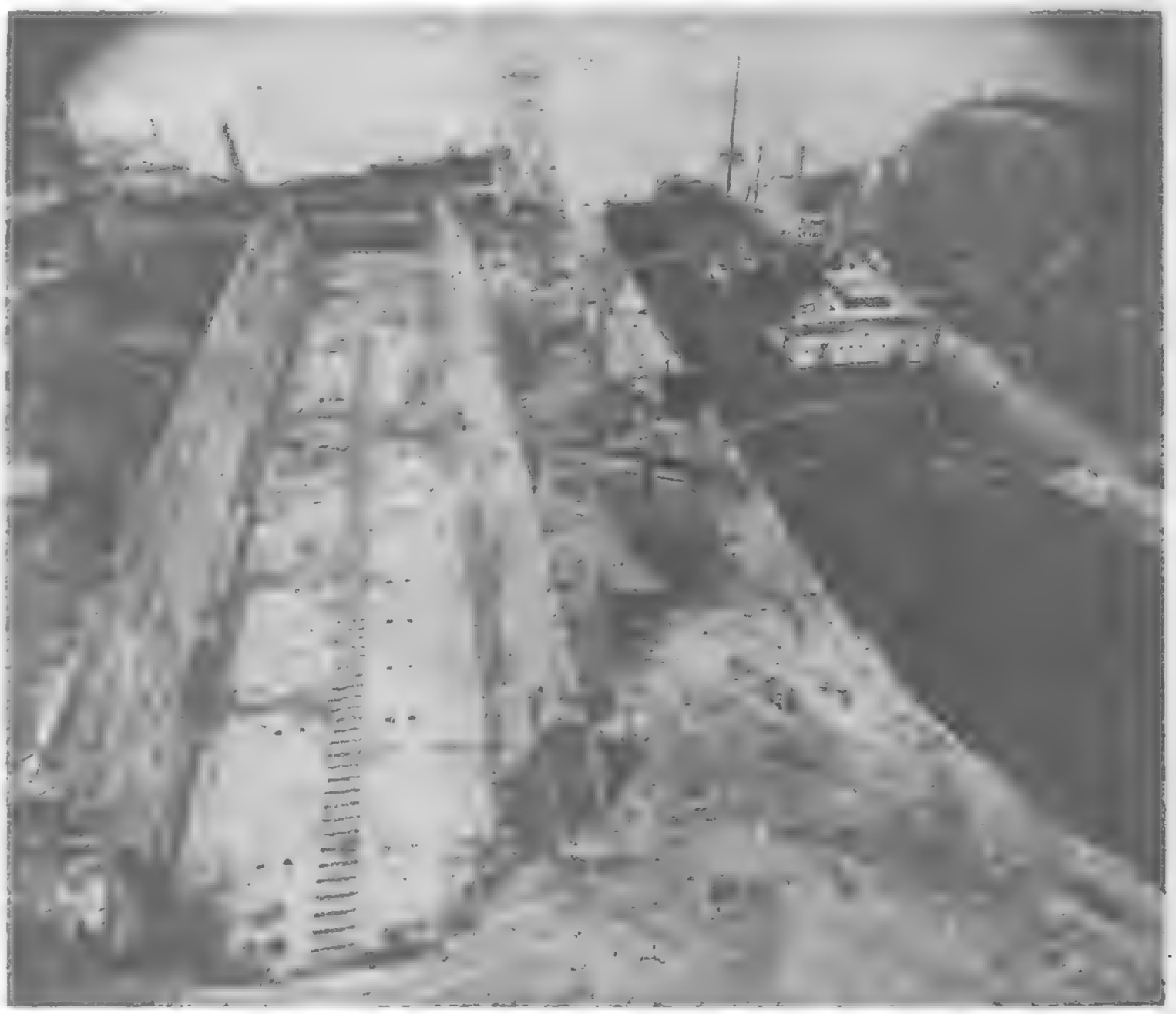
Tonnage: Gross 4,127, Dead Weight, 6,353, Under Deck tonnage 3,436; Net Register, 2,498; No. of Holds. 5.

Main Engines: Triple expansion surface condensing type.

With such an important fleet of its own and so many other vessels under charter, it was only natural that the Mitsui interests should embark in the shipbuilding business at a time when the demand for tonnage could not be readily filled by the other yards in Japan. In November, 1917, the Shipbuilding Department of the M.B.K. was organized and a temporary shipbuilding yard established at Uno, in Okayama Prefecture to build small cargo vessels. At the same time another tract of land nearby was acquired for the erection of a complete modern shipbuilding plant capable of launching and equipping vessels up to 15,000 tons. The Uno Yard went out of existence in 1919, giving place to the larger establishment fully equipped to compete for war tonnage with the other important yards in Japan. Two steamers, the *Eastern Importer* and *Eastern Exporter* were constructed at the Uno yard in 1917, for the American Government under the agreement for the exchange of ships for shipbuilding materials.

The Tama Ship Building Yard is situated at Uno, two miles from the Inland Sea, and about 64 miles west from Kobe.

The yard has four shipbuilding slips with corresponding shops, including draughting room, plate bending, galvanizing, wrought-iron, blacksmith, carpenters', boiler making, acetylene welding, copper-smith, finishing shops and foundry. There are 300 buildings in the compound including offices and warehouses, covering 13,800 tsubo in area.



M. B. K. Tama Dockyard: Drydock No. 1 on Right and New No. 3 Dock Completed in June, 1930

The Tama Ship Building Yard is equipped with three dry docks. No. 1 dock has a length of 485-ft. with an width of 74-ft. and a depth of 27-ft and a docking capacity d.w. 15,000 tons. No. 2 dock is 350-ft. in length, and 48½-ft. in width and 18-ft. in depth with a docking capacity, d,w. 6,000 tons. No. 3 dock is 470-ft. long, 74-ft. wide and 29-ft. deep, with a docking of d.w. 15,000 tons.

A mooring quay 1,200-ft. in length with a width of 25-ft. is located in the center of the ship yard permitting 10 vessels to be berthed at the same time, and undergo repairs. The Yard is served by three launches and two motor boats.

There are four building slips whose dimensions are as follows:

No. 3 Slip, length on keel blocks 450-ft.; entrance breadth 70-ft.; capacity 7,000 tons.

No. 4 Slip, length on keel blocks 600-ft.; entrance breadth 80-ft.; capacity 15,000 tons.

No. 5 Slip, length on keel block 600-ft.; entrance breadth 80-ft.; capacity 15,000 tons.

No. 6 Slip, length on keel block 450-ft.; entrance breadth 70-ft.; capacity 7,000 tons.

Nos. 4 and 5 Slips are of reinforced concrete construction, and with extension a vessel of 30,000 tons can be built.

Several cranes for various purposes are installed in the yard.

One floating crane of 70 ton capacity for installing engines and boilers.

One electric tower crane of 3 ton capacity and one of 6 ton capacity for hull building.

One yard crane of 3 ton capacity for transporting materials and one of 6 ton capacity.

Seven steam cranes each of 5 ton capacity for transporting materials and 15 travelling cranes with a capacity ranging from 5 to 35 tons.

Foundry, Tama Dockyard

M.S. "Ronsan Maru, 2,735 Gross Tons: Built and Engined by the Mitsui Tama Shipyard for the Dairen Kisen Kaisha's New Fleet

For water supply, there is a reservoir with a capacity of 7,000 tons supplied from Artesian wells in the compound, which supplies water to the shipyard and to vessels in the harbor.

Since the yard was founded, 51 steel vessels with an aggregated tonnage of 178,000 and three wooden vessels with a total tonnage of 4,500 have been built there, in addition to about 210 small steamboats, launches, motor boats, dredgers, lighters and other craft. In addition to docking, ship building and repairing, the Tama Ship Building Yard specializes in the production of marine and land engines and boilers of large capacity, Diesel engines, pumps, tanks, bridges, iron towers, pressure pipes, etc.

The M.B.K. Ship Building Department, owns the rights of manufacture and sale of Burmeister and Wain 4-cycle Diesel engines in Japan, Korea, Formosa, Saghalien and Manchuria.

M.B.K. Motorship "Akagisan Maru," 7,000 D.W. Tons, Built at the Tama Dockyard; Engined B. & W. 4-Cycle Crosshead Type, 1,800 H.P. Speed, 11 Knots; Oil Consumption 6¼ Tons in 24 Hours

Oertz Rudder Installations

The Mitsui Tama Shipbuilding Yard has also the Japanese rights to build under license, the Oertz Patent Rudder. Some idea of the remarkable increase in the number of Japanese vessels equipped with this invention by the Tama Dockyard, is seen in the last report of the Kobe Shipping Exchange dated May 1, 1930. The report shows that there are 56 Japanese vessels of a total dead weight tonnage of 315,751 already equipped with this device, with contracts unfilled for 55 ships of 274,469 dead weight tons, a total of 111 vessels of 590,220 tons.

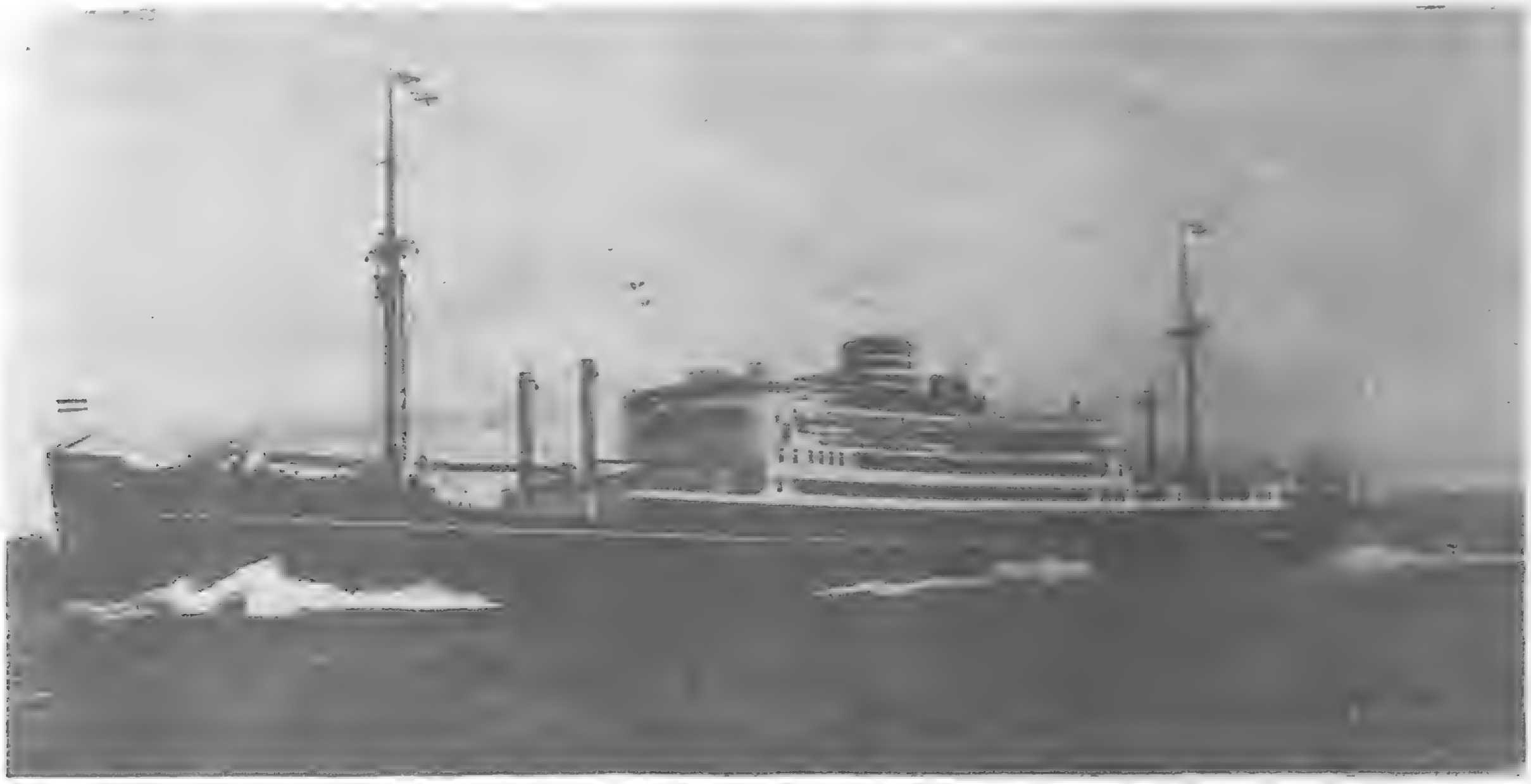
Scherzer Rolling Lift Bridge Over the Chukiang or Pearl River at Canton

(Continued from page 357)

When the abutment cofferdams are completed they will be pumped dry, excavation carried down into the red clay substrata into which the foundation piles will be driven and concrete poured. The piers will be supported on similar piles driven into red clay within the caisson and concrete poured into the lower sections. Each pier will be carried over high water level, the forms and the temporary caisson removed and used for the next pier. As soon as the abutments and piers are completed temporary piles will be driven and staging built to support the approach span.

The bridge, when completed, will supersede the present dangerous and inconvenient ferry service. Power for operation of the bascule spans will be taken from the mains of the Kwang Tung Electric Supply Co., incidentally the power plant equipment for which has been entirely supplied by Andersen, Meyer & Company, Ltd. and erected under the supervision of General Electric Co. and Andersen, Meyer & Co. engineers.

Illustration of sketch of the elevation of the bridge gives a general idea of the appearance after completion.



New 11,800 Ton N.Y.K. Motor Passenger Vessel "Terukuni Maru" for the Japan-Europe Service: Built by the Mitsubishi Zosen Kaisha

New N.Y.K. Liners for the Japan-Europe Service

"Terukuni Maru" and "Yasukuni Maru"

THE *Terukuni Maru* and *Yasukuni Maru* for the Japan-Europe Service of the Nippon Yusen Kaisha are approaching their completion in the Nagasaki Dock Yard of Messrs. Mitsubishi Zosen Kabushiki Kaisha. The keel of the former was laid down on January 9, and she was launched on December 19, 1929, whilst the keel of the latter was laid down on August 24, 1929, and she was launched on February 15, 1930.

The leading particulars of the vessels are as follows :—

Length overall	526-ft. 6-in.
Length B. P.	505-ft. 0-in.
Breadth moulded	64-ft. 0-in.
Depth moulded	37-ft. 0-in.
Gross tonnage	11,800 tons

The external features of each vessel include a raked straight round stem, elliptical stern, large superstructure; two pole masts and one funnel. Each ship has in all five decks designated the boat, promenade, bridge, upper and second deck respectively.

Each ship has been constructed and equipped under Teishinsho Special Survey, in accordance with the Shipbuilding Rule,

First Class Lounge

First Class Smoking Room

N.Y.K. Motorship "Terukuni Maru"

Main Engines of the N.Y.K. Motorship "Terukuni Maru" Mitsubishi-Sulzer Two Cycle, Single Acting, Air Injection, Ten Cylinders 680 mm Diameter and 1,200 mm Stroke: 10,000 S.H.P. Running at 100 r.p.m.

Ship Inspection Law, Ship Load-Line Law, and also with the requirements of the highest class of Lloyd's Registry under their Special Survey—class 100 A1.

Each vessel has a continuous cellular double bottom and is divided by eight watertight transverse bulkheads extending to the upper deck, in accordance with the new International Convention, so that the ship would remain afloat with any compartment open to the sea.

Above the upper deck, fireproof bulheads are arranged also in accordance with the requirements of the new Convention, suitably sectionalizing the upper portion of the ship, so that any outbreak of fire could be localized.

The constructors have taken exhaustive precautions to minimize the ship's vibration, and for the insulation of noise in the engine-room, as well as for the passengers' comfort to be derived from the most luxurious passenger accommodation.

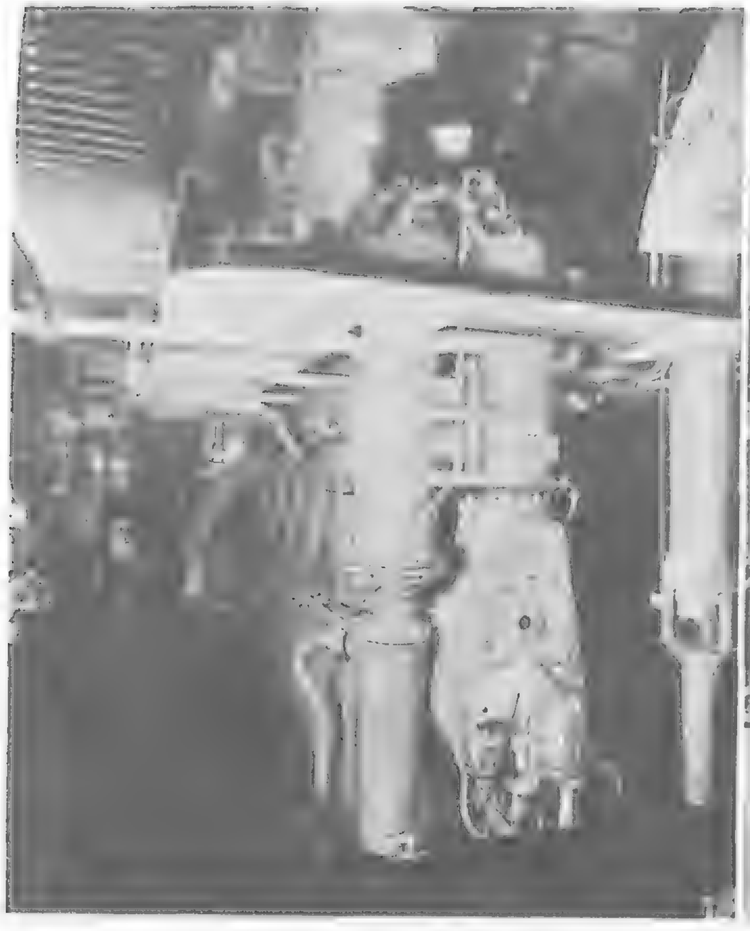
Equipment

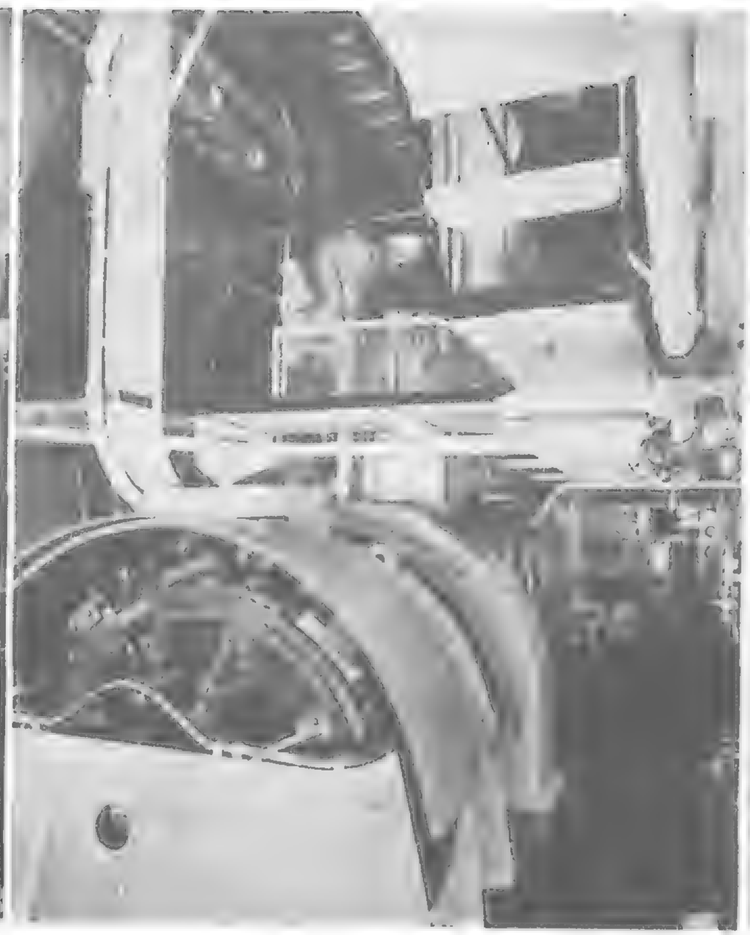
As each vessel, besides her passenger functions, is designed to carry considerable quantities of cargo in the lower holds and 'tween decks, the arrangements for working cargo form an important part of her equipment. There are six cargo hatchways giving access to the cargo spaces, and these are served by 19 Mannesmans steel cargo derricks and one heavy derrick, and, for quick handling of silk goods or tea, one cargo port is provided on each side of Nos. 2 and 5 'tween decks. Of these derricks, three each for No. 2 and No. 5 hatchways are capable of lifting 10-ton loads and

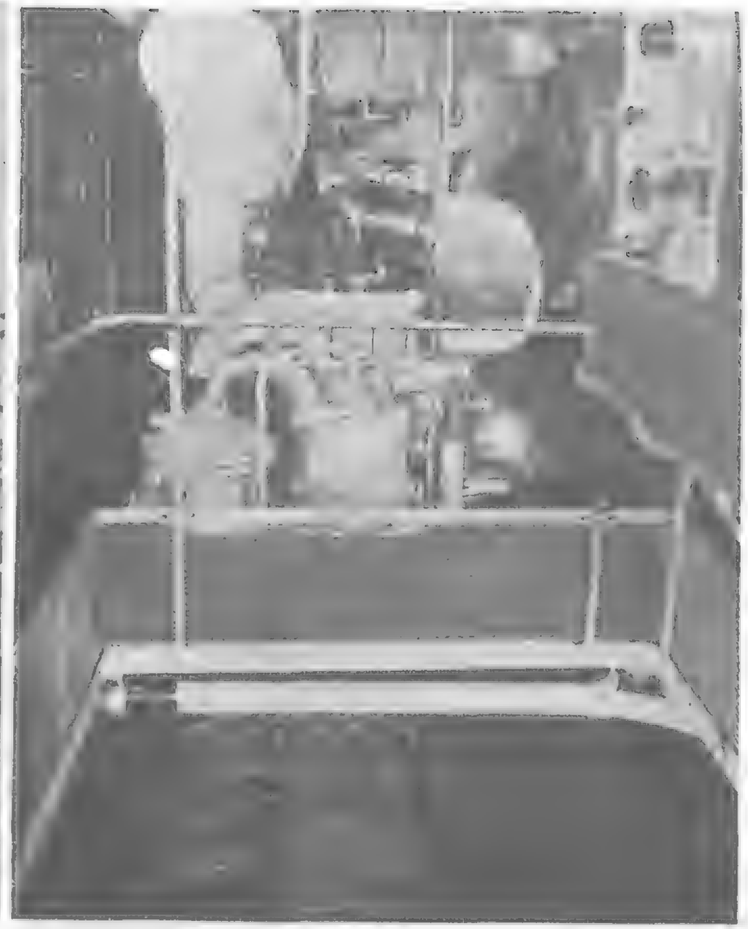
N.Y.K. Motorship "Terukuni Maru"

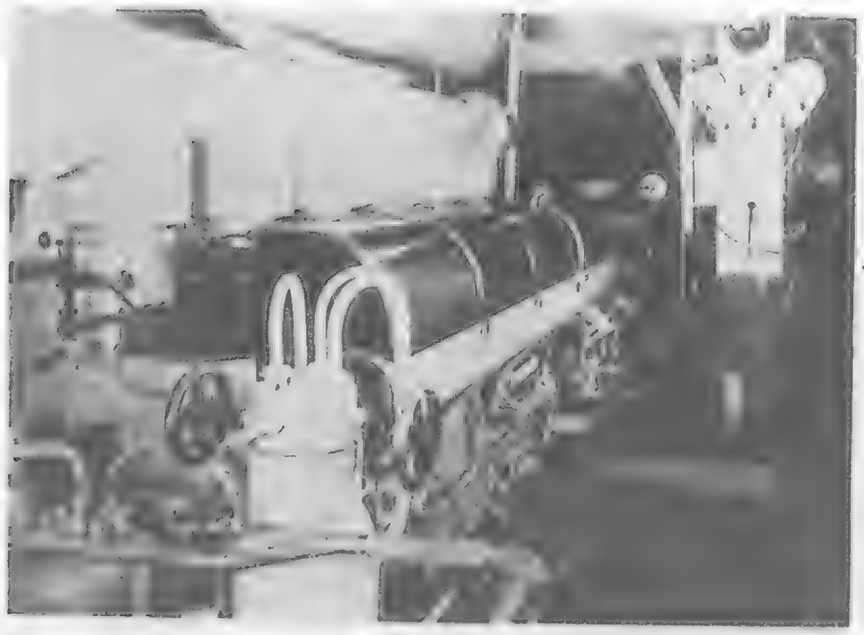
First Class Dining Saloon

First Class Reading and Writing Room









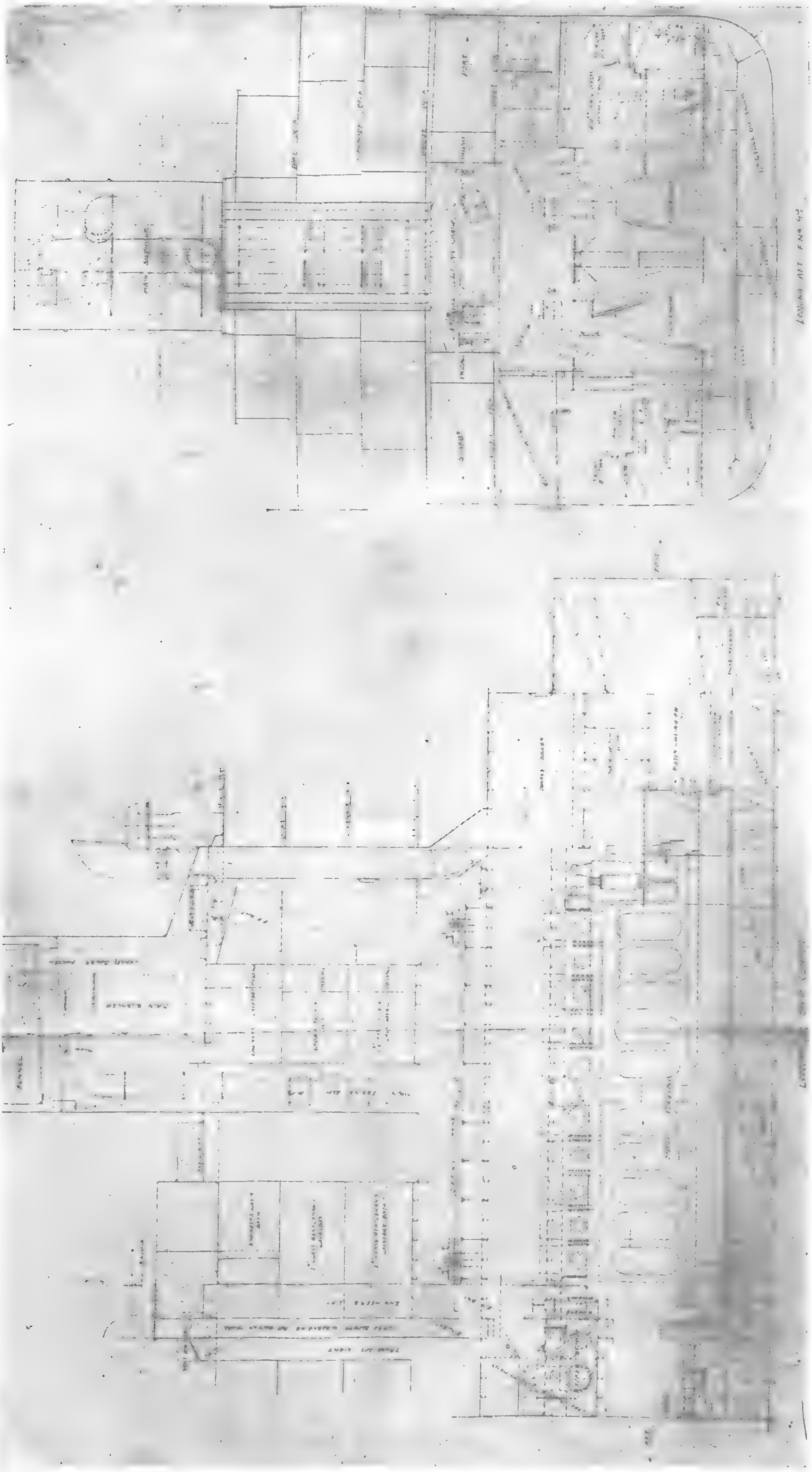
ENGINE ROOM

OF

M. S. " TERUKUNI MARU "

Showing Auxiliary Machinery.

Three W. H. Allen Sons & Co., Ltd., (B. & W.) 4 Cycle, Single acting, air injection Diesel engines, 675 B.H.P. operating three 450 kw. generators.



Machinery Arrangement of "Terukuni Maru" and "Yasukuni Maru"

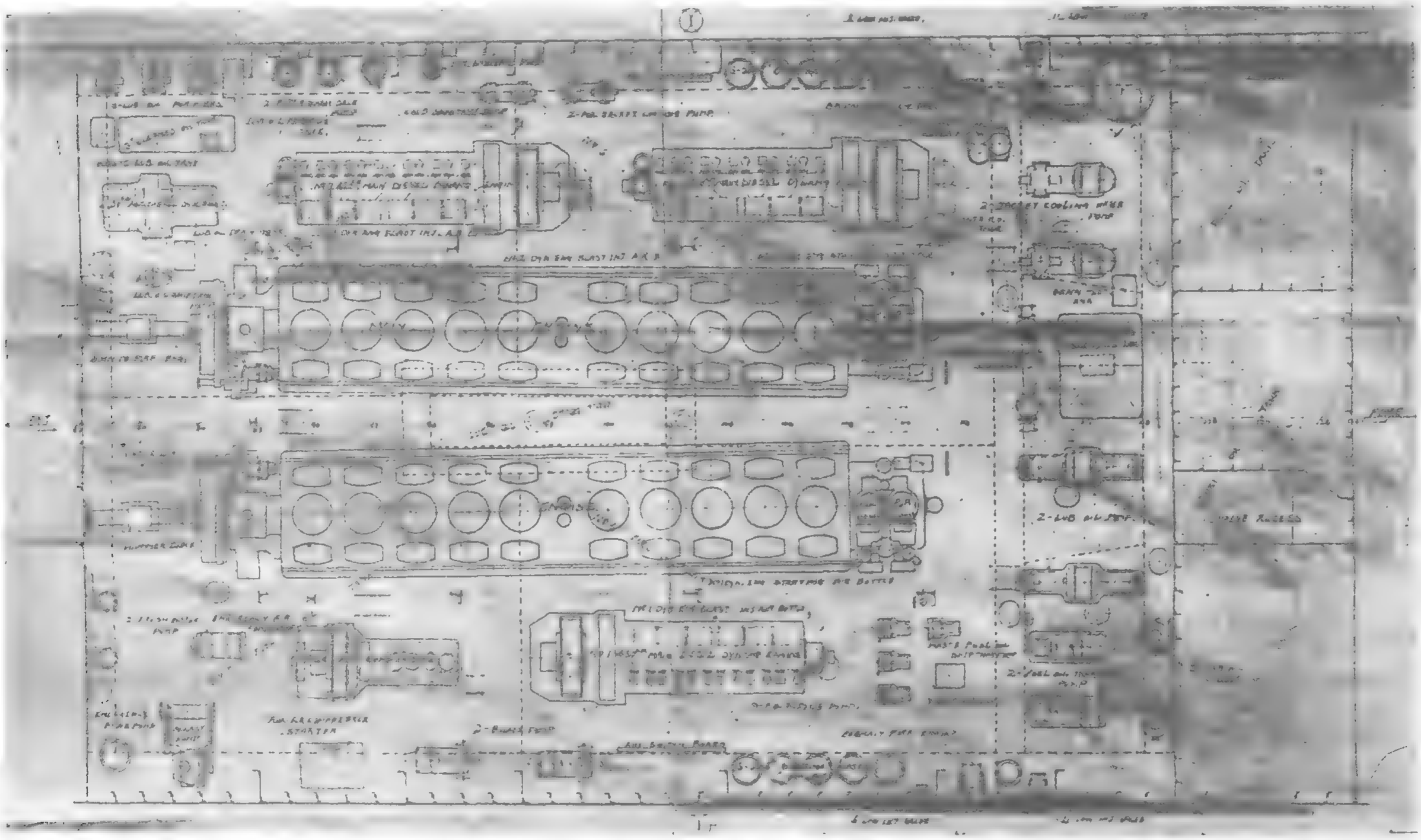
three for No. 1 hatchway are capable of lifting six tons, and the remaining 10 derricks are capable of lifting three tons, while the heavy derrick has the capacity of lifting loads up to 34 tons. For working these derricks, there are provided 19 electric cargo winches manufactured by Messrs. Laurence, Scott & Co. of England. All these winches are the makers' latest standard, worm-geared, electric cargo winches of a silent-running type, eminently suitable for passenger ships, obviating, as they do, the disturbance of passengers. Six out of 19 are capable of lifting a load of five tons at a speed of 130 feet per minute, and the remaining 13 are capable of lifting a load of three tons at a speed of 100 feet per minute, all having very quick speed at light and medium load.

An electric windlass manufactured by Messrs. Atlas-Werke of Bremen in Germany is arranged on the forecastle deck. The windlass is capable of exerting a pull, at the lifters, of 20 tons at 32 feet per minute, the electric motor being capable of developing 100 B.H.P.

There are also, for warping purposes, two electrically-driven capstans on the forecastle deck forward and two on the bridge deck aft, each capable of exerting a pull of 13 tons at 30 meters per minute with a motor of 135 B.H.P. In addition to these, there are also two capstans of smaller type arranged on the bridge deck aft, capable of exerting a pull of four tons at 150 feet per minute with a motor of 75 B.H.P., all the above capstans having been supplied also by Messrs. Atlas-Werke.

The steering gear has been supplied by Messrs. Brown Brothers & Co., Ltd., of Edinburgh. It is of the electro-hydraulic type in duplicate, each gear consisting of two hydraulic rams and a variable-stroke hydraulic pump driven by an electric motor of 40 B.H.P. Control from the navigating bridge is effected by a telemotor of Brown's make, and the gear is also mechanically controlled from the steering standard on the docking bridge as usual.

The two sets of Seager's multiple effect CO_2



Floor Plan Machinery Arrangement of the M.S. "Terukuni Maru" and "Yasukuni Maru"

refrigerating machinery to deal with the refrigerated cargo and cold store, have been supplied by Messrs. Kobe Steel Works, Kobe, Japan, and are placed at the 2nd deck level on the starboard side of the main engine-room. The plant includes two electrically-driven compressor engines and the necessary evaporators, brine pumps and other auxiliaries. The insulated cargo spaces are divided into four compartments, and provision is so made as to keep the individual compartments respectively at the various desired temperatures, and the plant is capable of keeping the whole of the refrigerated cargo spaces as low as 15°F., while the whole cold provision store is kept at the necessary low temperature and 4 cwt. of ice is being made per day.

The equipment of Life-Saving appliances embodies a number of noteworthy features and conforms to the elaborate requirements of Teishinsho, and British Board of Trade for passenger and emigrant vessels. Altogether there are 13 boats of various types and sizes having a capacity sufficient to accommodate all passengers and crew on board. One of the boats is motor-driven, equipped with a Thorneycroft motor, type R.D.4 35 B.H.P., a wireless installation and a searchlight, and another two of the boats are equipped with Fleming's manual propelling gear, by which even lady passengers can propel the boat, by merely reciprocating the levers which rotate the propeller through the propeller shaft.

The boat-launching appliances have been supplied by Messrs. Welin-Maclachlan Davits, Ltd., and are capable of placing all the lifeboats in the water in a few minutes. There are eight sets of gravity-type davits operating seven single lifeboats with a capacity for 51 persons each and a motor-boat with a capacity for 37 persons, and two sets of Welin's quadrant davits, which operate a lifeboat with a capacity for 32, as well as a collapsible, decked lifeboat stowed underneath, with a capacity for 40. In addition to the above, there is a "Temma" as a working boat arranged on the aft boat deck under ordinary davits.

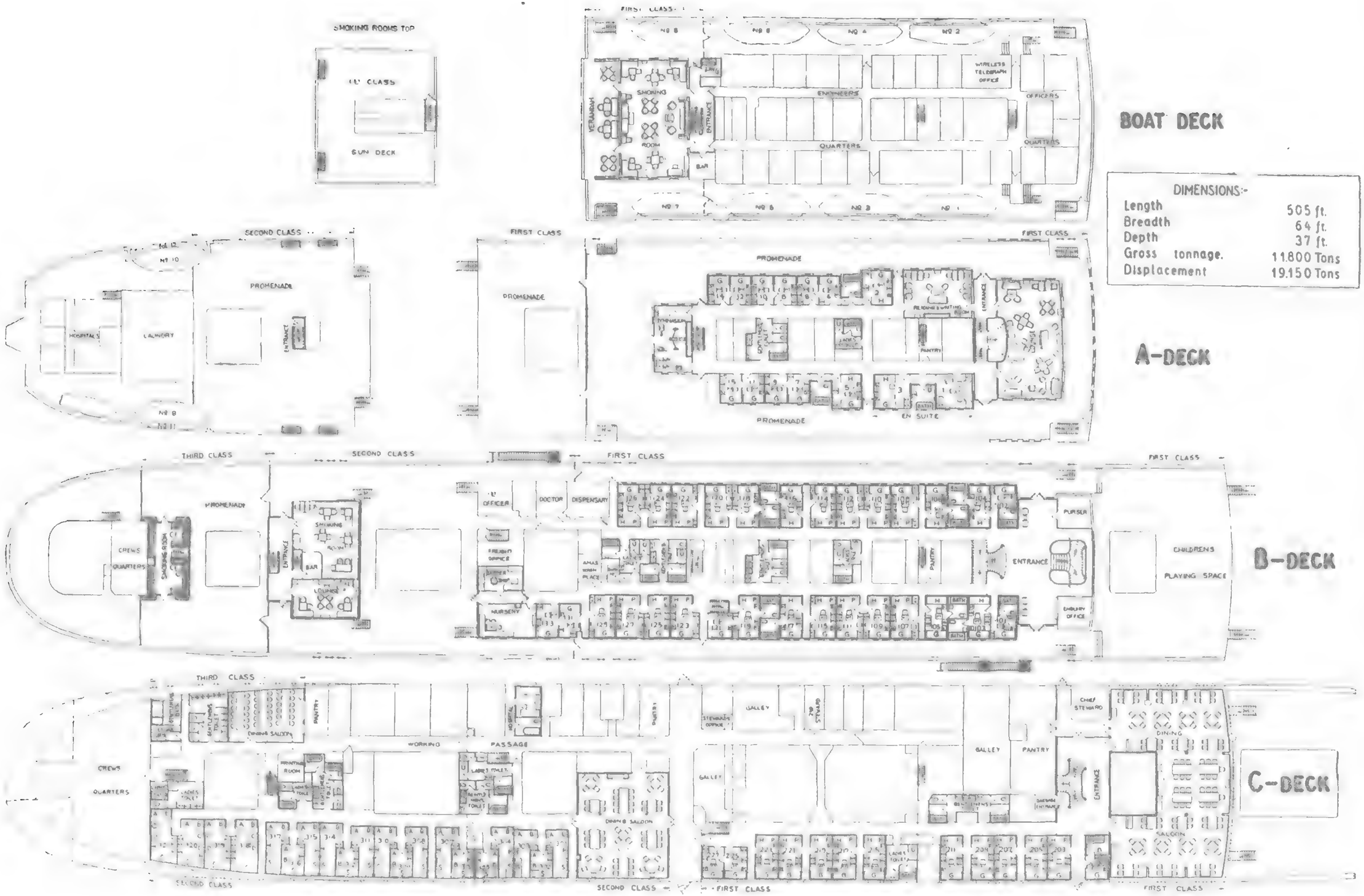
There are eight sets of boat winches attached to gravity davits working through wire falls ensuring rapid and reliable lowering of the lifeboats to the water. Mill's patent (waterborne) boat-releasing gear is also adopted, in order to prevent unsafe releasing before the boat is completely water-borne.

Especially noteworthy is the elaborate equipment of fire-detecting and extinguishing appliances; these include the Rich-Lux fire-detecting and extinguishing system of Walter Kidde & Co., U.S.A., automatic fire alarm, complete hydrant arrangement and the usual hand chemical extinguishers. The Lux CO_2 system as well as hand chemical extinguishers are also installed in the machinery compartments. In the Rich-Lux system, smoke accumulators are fitted in cargo or store compartments, and these are connected by steel tubes to a detector cabinet in the wheel-house, so that an outbreak of fire in any compartment may be soon detected by the officer on watch; then the officer has only to run to the CO_2 valve manifold arranged at a very easily accessible place in the 'tween deck and to open the valve; the compartment is then soon filled with CO_2 gas which extinguishes the fire. CO_2 gas is supplied from bottles arranged in a special compartment near the engine-room.

An automatic electric fire alarm system has been installed to protect all public rooms, staterooms, officers' cabins and crew's quarters. One or more sentinel thermostats are fitted in each compartment, and the whole sentinel thermostats are grouped into a number of convenient circuite to facilitate discovery of the sentinel affected, should the alarm in the wheel-house ring, an alarm gong having been fitted in both wheel-house and engine-room.

In other respects every attention has been given to safety appliances throughout the vessel; for instance, "Scott-Ross" system of watertight doors electrically controlled from the bridge in case of emergency; very complete wireless installation and two searchlights on top of the navigating bridge, and one powerful searchlight on forecastle head for use when the ship goes through the Suez Canal.

The ventilation of the vessel, both natural and mechanical, has received very careful consideration. The mechanical ventilation throughout, including the engine-rooms, is carried out by an installation of fans of various capacity supplied by the Thermotank Co. of Glasgow. The patent "Punkah Louvre" system has been adopted for supplying air to all the passenger accommodation. By the adoption of the "Punkah Louvre" system, fresh air is brought into the various rooms through trunkings, making passengers feel quite comfortable especially in the Tropics. The exhaust from the rooms is also effected by mechanical means, and attention has been given especially to the change of air in the galleys, pantries and lavatories.



Plan of Passenger Accommodation N.Y.K. Motorship "Terukuni Maru" and "Yasukuni Maru"

Electric heaters of Messrs. Mitsubishi Denki Co., Ltd., are fitted in the majority of the first class public rooms, and in the individual first and second class staterooms, and steam radiators have been provided throughout the third class passenger and crew's quarters and also in the first and second class dining-saloons, and in the passage ways in the first and second class accommodation.

Among the notable equipments, there are an Anschtz master gyro-compass, steering and bearing repeaters, a continuous course recorder, the hydro-electric "Sal" log, a combined speed-indicator and distance-recorder working in paralled with Walker's electric log, complete set of Marconi's Direction Finder, George Kent's clear view screens, Robinson's telegraph, and loud-speaking telephones supplied by Messrs. Alfred Graham & Co., London, Kelvin's latest motor-driven sounding machines, Gelap's Helm Indicators, electrically-operated clocks, Evershed & Co.'s engine revolution indicators, and "Teledep" pneumatic gauge of Dobbie, McInnes of Glasgow.

Propelling Machinery

The main engines are of the two cycle, single-acting, air-injection Sulzer's standard type made by Messrs. Mitsubishi Zosen Kaisha, Nagasaki, having ten working cylinders of 680 mm. bore and 1,200 mm. stroke. Each of these cylinders develops about 640 indicated horse power. The mechanical efficiency being 78-80 per cent., the normal aggregate output amounts to 10,000 S.H.P. when running at 100 r.p.m.

Each engine is provided with two injection air compressors, connected at the fore end of the engine with 180° crank angle. The compression is in three stages, the low pressure being double acting. Should one of the four compressors break down, or give trouble, the rest can supply the necessary air to run the two engines at full power.

The manoeuvring platforms are situated on the floor level at the forward ends of the engines. All necessary handles, indicators, alarm signals, fuel pumps and other important valves are assembled there. The necessary pumps, coolers, main switchboard, and the starters for turbo-blowers are arranged on the fore part of this platform for easy manipulation.

The engine in general does not depart from the standard design of Sulzer's 10ST68 type, except in certain detailed parts which are improved by the maker. One of the remarkable improvements is the reversing gear, *i.e.*, in the standard type, the reversing is only effected by hand, whereas it is done by compressed air engine as well as by hand wheel in this case. Another improvement is in the working piston skirt, *i.e.*, whilst in the standard type, the skirt is of one piece, it is constructed in two halves, upper and lower, bolted to each other, so that either of these halves can be renewed independently when partly worn or cracked.

It is to be noted that almost all the main parts of the main engines are home made, and only a few parts, such as vital springs, injection air bottles, compressor valves, telescopic tubes and cylinder lubricators are made by foreign makers.

Turbo-Blowers

For the supply of scavenging air to the main engines, two sets of Brown Boveri double suction turbo-blowers type VZMH-1201 are provided, one acting as a spare. The blowers are directly connected to 386 kw. electric motors, and each can supply 1,350 cub. meters of air per minute against an absolute pressure of 1-125 kg./cm^2.

These blowers are installed in a suction chamber, which is constructed on the aft second deck; the air from the boat deck is drawn in by the blowers to this chamber through a vertical common trunk insulated against noise.

The chamber is provided with another suction from the main engine-room, so that the blowers can assist the ventilation of the engine-room and under the floor.

Circulating System and Aux. Pumps

The pistons of the working cylinders of the main engines are cooled by fresh water. Two sets of Amag-Hilpert's vertical, centrifugal, motor-driven pumps of 100 m^3/H at 4.5 kg./cm^2 are arranged, one being sufficient for the purpose with the other as a spare.

The fresh water delivered by these pumps is cooled by the fresh water cooler of the vertical condenser type, and the hot returns from the working pistons are collected into an oil-separating tank, which has sufficient capacity for the whole quantity of the circulating fresh water. Two air chambers with an air pipe each and two light non-return valves are fitted on each hot return main pipe to the oil-separating tank, so that cooling water circulates satisfactorily even when the ship is pitching. The make up supply of circulating fresh water is brought by gravity from the feed water reserve tank for the donkey boiler to this collecting tank.

Salt water cooling connections for piston cooling are also arranged for emergency, the hot return to the collecting tank in this case being led to the bilge way and pumped overboard by bilge pumps.

The cylinders, jackets, exhaust gas manifolds, fresh water cooler and oil coolers are cooled by salt water, and for this service two sets of horizontal, centrifugal, motor-driven pumps, made by Mitsubishi Zosenjo at Kobe, are provided. The capacity of each pump is 420 m^3/H at 25 m. of total head.

For forced lubrication of the main engines, two sets of electrically-driven, Neidig cogwheel precision lubricating oil pumps are provided. Each set comprises one low pressure and one high pressure oil pump mounted on a common bed plate with one D.C. variable speed motor in the center. The low pressure pump serves for lubricating bearings and crosshead quides of the main engines, and is capable of delivering about 75 m^3/H at 3 atmos. The high pressure pump is used only for lubricating the crossheads of the main engines, the capacity being 10m^3/H at 18 atmos.

The fuel oil used for the main and auxiliary engines is settled and purified. The fuel oil is first settled by heating in the settling tank for about half a day, then pumped up to a 2-ton head tank for fuel oil purifiers by one of the three fuel oil service pumps. The fuel oil purifiers, of Baltic vaportight type No. 1062, are fed by gravity from this head tank, and discharge the purified oil to the cleaned oil reserve tank of 27 tons in capacity by means of a small pump driven by the same motor as drives the purifier.

The cleaned oil in this tank is then transferred to a 2-ton service tank by another service pump, and thence the oil is led to the main and auxiliary engines through double strainers.

The whole system of oil treatment and supply is kept in constant working condition independently from the load of engines, and for making known the accidental stoppage of the system, the alarm system is adopted.

Dynamo Engines

For supplying electric power to the various engine-room and deck machinery, lamps, heaters, and other electric apparatus, three main 450 kw., and one auxiliary 50 kw., Diesel generators are installed on the sides of the main engines.

The main Diesel generators are built by Messrs. W. H. Allen, Sons & Co., Ltd., at Bedford, England, under license, on the B. & W. 4-cycle, single-acting, air-injection principle, each having six working cylinders 410 mm. bore by 600 mm. stroke and one three-stage injection air compressor, capable of developing the normal rated output of 675 B.H.P. when running at 250 r.p.m.

The auxiliary generating set is of the M.A.N. 4-cycle, single-acting, solid injection engine G3Vu33, with 3 cylinders of 210 mm. bore with 330 mm. stroke, capable of developing the normal output of 80 B.H.P. at 420 r.p.m.

The generators coupled to these sets of machinery are all of the direct current, drip-proof, multipolar, flat, compound-wound type based on the British Engineering Standard Specification and constructed for perfect paralled operation, voltage regulation being limited within 3 per cent. above or below 225 volts. These engines are cooled by salt water, and two Allen's horizontal centrifugal pumps of 80 tons per hour each are fitted for this service, one of the two standing as a spare. For the purpose of extracting oil vapor in the crank-case of the three Diesel generators, two sets of vapor extractors made by the Keith & Blackman Co., Ltd., are installed.

Compressed Air Plant

Compressed air for starting and reversing the main engines is stored in ten high pressure air bottles of 2,000 litres at 70 atmos. and two low pressure air tanks of 9 cub. meters at 32 atmos.

For charging these air storage vessels, there are fitted one Mitsubishi-Sulzer 3-stage air compressor 4C36 driven by a D.C. variable speed motor. This has sufficient capacity for supplying the injection air to the main engine, when one set of the main compressors breaks down.

For the first charge of the starting air bottle of the main Diesel generator, one motor-driven emergency air compressor of the Sulzer's pattern 1C-11 is installed, electric power being supplied by a 30 kw. emergency generator on the boat deck.

Steam Plant

On the opposite side of the turbo-blowers and on the same level as the upper grating of the main engines, there is a boiler compartment constaining two single ended Scotch boilers, 9-ft. 0-in. long and 9-ft. 0-in. in diameter, constructed in compliance with the Teishinsho Lloyd's and American Rules for working pressure at 100 lbs./sq. in., each having 75.6 m^2 of heating surface for raising the steam necessary for galleys, room heating, laundries, steam-driven pumps, whistles, calorifiers, oil settling and other purposes. The steam pumps, condensers, burning unit, evaporator, feed heater and other tanks are arranged in the same compartment.

Ventilation

For ventilation of the engine-room, four sets of ordnance fans driven by 16 H.P. variable speed motors are arranged. As for the trunking, special attention has been paid to preventing the accumulation of combustible oil vapor under the engine-room floor.

Ship Auxiliaries

Besides the above-described pumps, there are numerous ship auxiliaries. The following is a brief description thereof.

1.—Ballast and Bilge Pumps.—One set of two-throw, vertical, double-acting type driven by 25 H.P. motor by means of Maag reducing gears, and two sets of horizontal self-priming centrifugal pumps are fitted for the service of bilge and ballast water pumping.

It is to be noted that a large bilge water separator made by the Stream Line Co. is fitted for keeping the discharged bilge water free from oil and for diminishing the oil wasted. As an emergency, there is a vertical, immersible, Drysdale's S.O.S. pattern bilge pump, which is driven by an 18 H.P. electric motor and which delivers 140 tons per hour at 2.1 atmos. The motor is connected with an emergency electric circuit and the delivery valve of the pump is controlled from the outside of the engine casing.

2.—Sanitary, Fire and Wash Deck Pumps.—For the sea water services, two high pressure and two low pressure pumps are installed side by side on the port side of the engine-room, all pumps being of the vertical, motor-driven, centrifugal type made by Amag-Hilpert Ges., Germany.

The former two sets are of the same size and deliver 80 and 120 m^3/H at 7 and 4 atmos. respectively. When they are used for fire and wash deck purposes, their delivery pressure can be regulated to 7 atmos. with the delivery of 80 m^3/H. while for the cold, sanitary use they are regulated to deliver 120 m^3/H at 4 atmos. by means of varying the motor speed over a wide range and controlling the spring-loaded relief valves.

The larger one of the latter two sets is used only for cold salt water sanitary services, and the smaller set stands for its spare as well as for the hot salt water services.

3.—Oil Pumps.—Two sets of Neidig precision cogwheel pumps, each 100 m^3/H in capacity at 2.1 delivery pressure, are provided for shifting fuel oil between tanks.

As in the above description there are three fuel oil service pumps, which are also of Neidig precision motor-driven, horizontal cogwheel type Su-1B1 form E, capable of delivering 5 m^3/H at 2.1 atmos. of delivery pressure.

Besides these pumps, there are provided two sets of drinking water pumps of vertical type, and one gear pump which chiefly serves for pumping up lub. oil from the drain tanks to the head tanks for purifiers. It is one of the noteworthy arrangements that every drop of oil from these oil pumps and numerous oil tanks is led to the waste oil tanks fitted under the floor, and separated and utilized for steam raising.

Passenger Accommodation

Every effort has been made to provide the utmost comfort and luxury for the passengers.

The First Class State-Rooms are distributed over A and B decks, and also on the forward part of C deck. The number of rooms and of passengers accommodated therein are as follows :

	No. of rooms.	No. of passengers.
Suite de Luxe	1	3
Single rooms	13	13
Single rooms with bath	5	5
Double rooms with bath ...	8	16
Rooms for 3 persons	26	78
Rooms for 3 persons with bath...	2	6
Total 1st class	55	121

The Suite de Luxe is situated on the starboard side and at the front part of A deck. It comprises a sitting-room, a bed-room, a private bath, etc.

All the first class rooms are not only spacious, but are outside rooms with large windows opening directly on the sea. They are equipped with wardrobe, bedside cabinet, washstand with cold running water, table, etc. Except the rooms for three persons which have two beds and one pullman berth, all the rooms are equipped with beds of the land type with Simmons " Beautyrest " mattresses. The decoration of the rooms is neat and most pleasing.

Smoking-Room, is located at the aft end of the boat deck. The structure and the decoration are in pleasing simplicity after the Jacobean style. The frieze and the ceiling have the finish of plaster. The walls are panelled oak stained a light hue, and the floor is covered with ruboleum. The wall lanterns of antique brass, the oil paintings, and the mantlepiece of carved stone give dignity to the room. It is equipped with sofas, chairs and table and is an ideal place for smoking, chatting and playing various kinds of games. There is also a bar attached to the room, and above the room is the spacious sun deck covered with an awning.

Verandah Cafe, adjoining the smoking-room, commands a fine view to port and starboard as well as in the rear. It is provided with cozy chairs.

Lounge, located at the foremost part of A deck, is decorated after the style of the Italian Renaissance. The cornice with dentil enrichment and the ornamental frieze are all in fibrous plaster, and the wall panelling is executed in hardwood molding. There are an attractive fire-place, wrought-iron antique windows and Axminster carpets. The room is provided with comfortable settees, chairs and tables and also contains a grand piano, phonograph and radio.

Reading and Writing-Room, situated on the port side of A deck adjacent to the Lounge. The ceiling of plywood, the walls with hand-painted decorations, and the Chinese carpets are all in excellent harmony. The room is equipped with a large book-case, settees, circular tables in red lacquer, double writing-tables, etc.

Gymnasium, situated on the rear of A deck ; its walls and the ceiling have a light painted finish. It is equipped with the most up-to-date gymnasium accessories.

The First Class Dining-Room, situated on the front part of C deck, extending to port and starboard, is decorated after the eighteenth century English style. With a cornice with leaf enrichment, wall panelling of hardwood and Axminster carpet runners, the saloon has a cozy appearance. A large sideboard with a marble top, and an elliptical mirror are in the room, the saloon is provided with many tables of various sizes.

Nursery. At the aft end of the middle part of B deck, on the starboard side, the nursery or children's room is located. It is attractively decorated and furnished with all kinds of playthings and toys for the amusement of the younger passengers.

The Barber Shop is adjacent to the Nursery.

The Second Class Staterooms are situated on the after part of C deck. The accommodation is as follows :

	No of rooms.	No. passengers.
Rooms for 3 persons	16	48
Rooms for 5 persons	4	20
Total 2nd class	20	68

(Continued on page 399).

The Blue Star Motor Vessel "Tuscan Star" on Trials

Blue Star Motor Liner "Tuscan Star"

A Twin-Screw 9,000 b.h.p. Sulzer-engined Vessel, with the Largest Refrigerated Capacity of Any Ship Afloat

(From "The Motor Ship," May, 1930)

In many respects the M.S. *Tuscan Star*, which is the first oil-engined ship placed in service for the Blue Star Line, is a most remarkable vessel. She is, first and foremost, a cargo-carrying ship and has the largest refrigerated capacity of any vessel in service. Considering that only 12 passengers are carried, the accommodation, located in a specially reserved part of the ship, is laid out on a scale hitherto unknown for a vessel of this particular character. The galley is electrically equipped, likewise the bakery, while the pantry is also fitted with electrical apparatus. All the auxiliaries are electrically operated and the aggregate power of the Diesel engines driving the dynamos for the supply of current is 2,000 b.h.p.

There are no fewer than five centrifugal purifiers on board ; an exhaust gas-heated boiler serves the accommodation ; there is a bilge separator to ensure that no contaminated water is pumped overboard. Twelve CO_2 compressors, in three sets of four apiece, are installed in what is no doubt the largest refrigerating equipment yet designed for marine service. Three refrigerating engineers attend to the plant, there are three electrical engineers carried, 11 engineers are allocated to the main and auxiliary engines, while each of the total of 17 engineers, senior or junior, has a separate cabin. Other features of this vessel will be dealt with in the course of this article, which includes extensive details which we obtained during the progress of the trials. Furthermore, we again visited the *Tuscan Star* after her arrival in London from the Tyne. The voyage was wholly successful—as were the trials—and the ship left last month on her maiden trip to South America. The leading details are given in tabulated form herewith :—

Length overall	490 ft.
Length between perpendiculars ..	470 ft.
Breadth	68 ft.
Depth	39 ft. 9-ins.
Maximum draught	30 ft.
Gross register	11,449 tons
Displacement	20,510
Block coefficient	0.718
Refrigerated cargo space	600,000 cubic ft.
Number of holds	7
Speed, loaded	15 knots
Machinery output	9,000 b.h.p.
Number of cylinders, each engine ..	8
Diameter	680 mm.
Stroke	1,200 mm.
Revolutions	115 per min.
Propeller pitch	16 ft. 3 ins.
Propeller diameter	15 ft.
Expanded surface	75 sq. ft.
Classification	Lloyd's 100 A1

That the information which follows, supplementing the tabulated details, covers a wide range and that the accompanying illustrations are fully representative of the ship and her machinery are due to the courtesy of the owners of the *Tuscan Star*—in particular to Mr. Leonard Dewey, the general Manager of the Blue Star Line, and to Mr. E. A. Thomson, the senior superintendent.

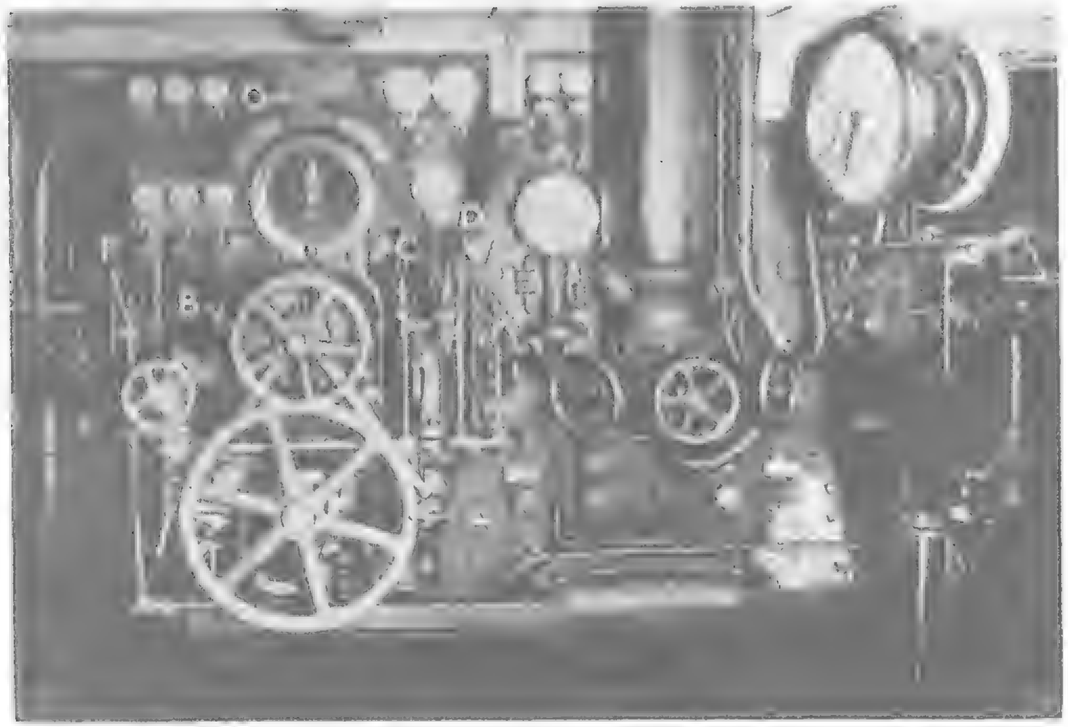
The hull was built by Palmers Shipbuilding and Iron Co., and the engines, main and auxiliary, were constructed by Sulzer Bros. at their Winterthur works. On the trials the engine builders were represented by Mr. Batho, while Mr. Andrew Hamilton, of Messrs. Goodwin-Hamilton and Adamson, Liverpool (the owners' consulting naval architects), was also present. The ship attained a maximum speed of 17.2 knots, the mean speed being 16.7 knots on a draught of 17 ft. forward and 20 ft. aft. in unfavorable weather.

A large number of manoeuvres were executed with commendable rapidity, the most striking test being the reversal of the main engines with the ship under way at full speed ahead. This trial is, of course, one of extreme severity, for the force to be overcome against the tendency of the screws to continue their rotation in the ahead direction is appreciable. It is satisfactory to record that in the circumstances described one engine reversed and fired in the astern direction almost instantly—indeed, so rapid was the manoeuvre that it formed an interesting contrast with the reversal of a reciprocating steam engine of similar power—while the other was reversed after a very brief interval. One of the illustrations indicates the control station of the port engine and is lettered for reference.

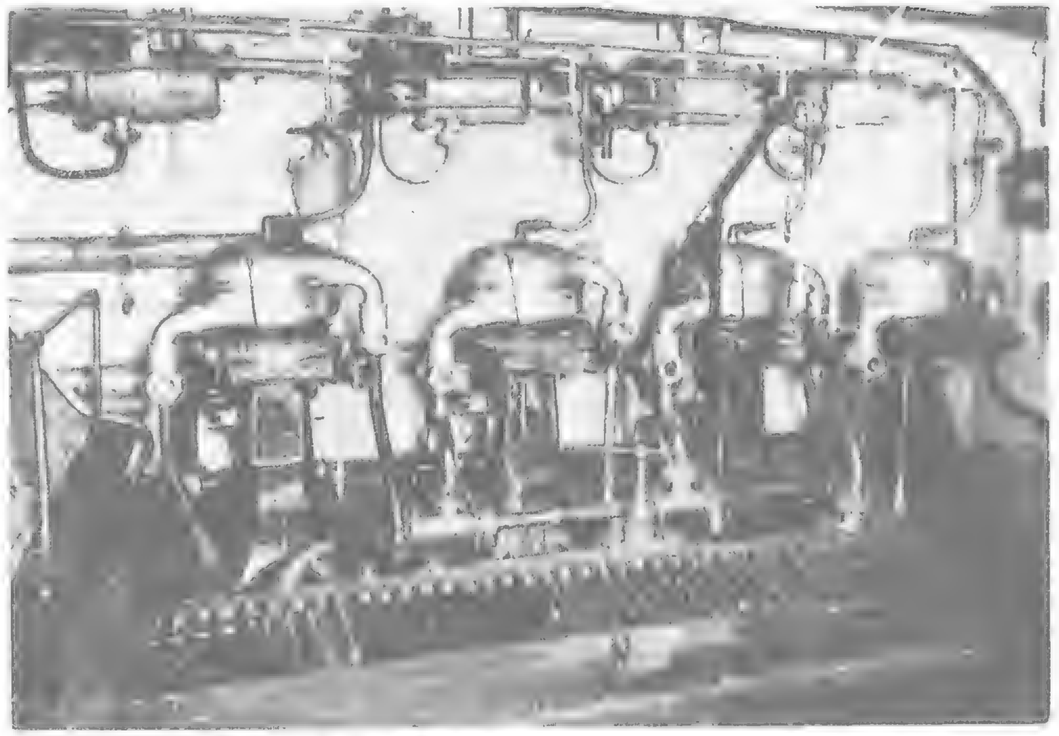
The Main Engine Controls

Although it can scarcely be stated that the main Sulzer engine controls are of a new type, there is a modified arrangement which is worthy of note, while the position of the manoeuvring platform, *i.e.*, at the forward end of each engine on the floor level, is unusual. There is a large handwheel (*a*) which is sufficiently high to be

IN THE ENGINE-ROOM OF THE M.S. "TUSCAN STAR"

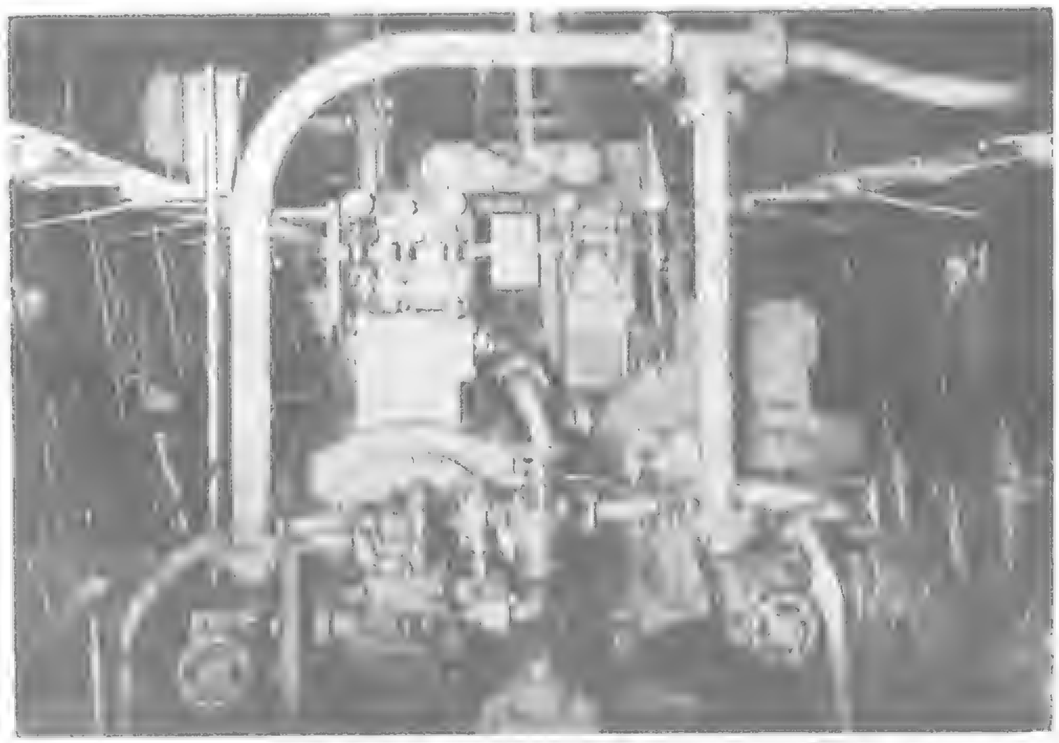


The Controls for One Engine. The Letters are Referred to in the Text

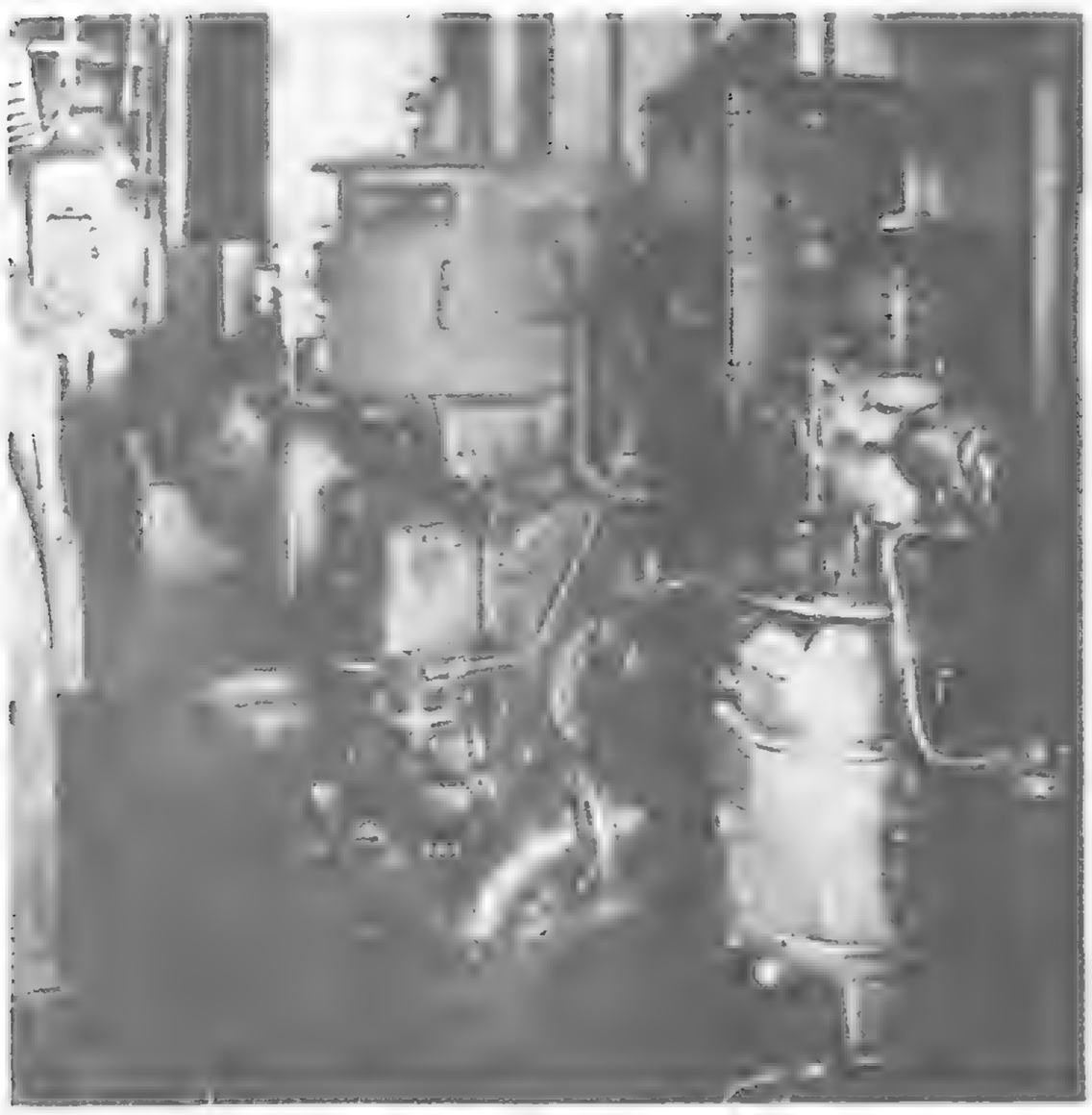


The Battery of Fuel and Lubricating Centrifugal Separators

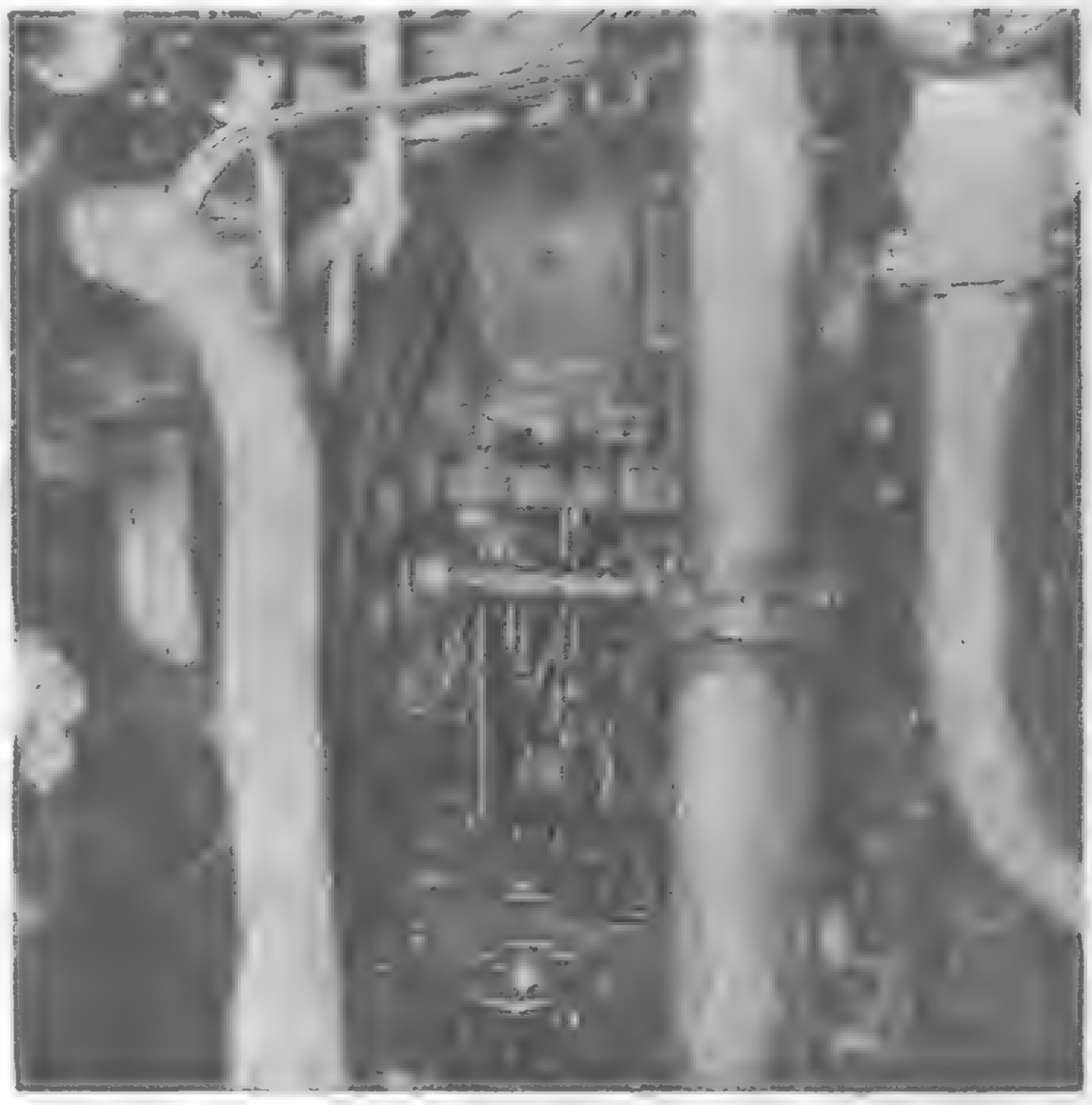
The Top of One Engine. A Cylinder Cover is Seen Lifted for Inspection After Arrival at London



The Duplicate Lubricating Oil Pumps with the Monitor Alarms on the Board at the Back



Combined Circulating and Air Pump, a Ballast Pump and, in the Background, a Bilge Water Separator



All the Plunger Pumps in the Engine Room are Chain Driven. The Illustration Shows a Fuel Transfer Pump

conveniently turned by hand. The wheel above (*b*) actually forms the flywheel of the starting engine, which is merely a compressed air motor.

The hand lever (*c*) places the starting engine in operation either ahead or astern, giving in the first place air to eight cylinders, then fuel to four and finally fuel to the whole engine. Once this lever is moved the sequence of operations occurs automatically and the lever returns to its original position. Speed control is effected by varying the opening of the fuel pump suction valves, the lever (*d*) for the purpose being arranged centrally. There is another lever (*e*) for regulating the blast air injection compressor inlets. Incidentally, each engine drives two blast-air compressors from an extension of the crankshaft.

It is with respect to a fourth lever (*f*) that particular attention may be drawn. Normally, the large wheel (*a*) is moved entirely by hand, but in this instance the lever (*f*) is moved to control a power supply in the form of a reversing engine. When the desired position of the wheel is reached the power is cut off by returning the lever and the engineer is at liberty to adjust the wheel as desired. The camshaft in the Sulzer engine is not moved in a fore-and-aft direction. The ahead and astern rollers are mounted in a carrier and lie in a plane with their respective cams. The hand adjustment of the wheel (*a*) gives an advance or retard effect up to a limit of 10 degrees either ahead or astern, the position for each direction of rotation being recorded by a pointer (*g*).

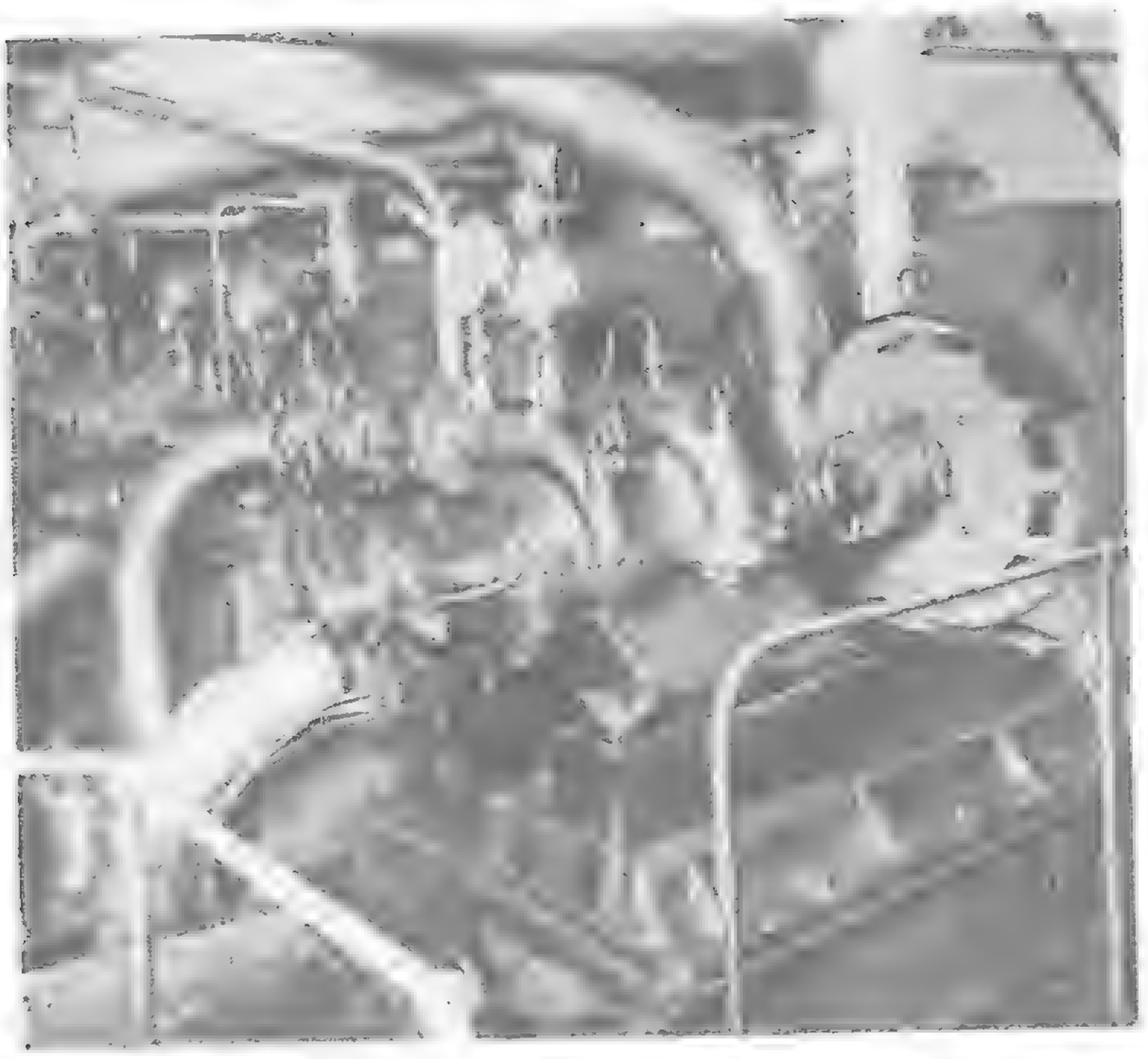
Main and Auxiliary Engine Design

The dimensions, power and speed of the main engines have already been recorded in the table. Taking the output as 4,500 b.h.p. in eight cylinders at 115 r.p.m. the mean effective pressure referred to brake power is approximately 74 lb. per sq. in. We may assume that the mechanical efficiency stands at the same figure, namely, 74 per cent., so that the mean indicated pressure at the full rated output is 100 lb. per sq. in.

In its general design each main engine follows the standard Sulzer practice and is of the controlled port-scavenging two-stroke type with twin rows of ports. The auxiliary engines are four-stroke units, each rated at 500 b.h.p. in five cylinders, fitted with blast air-injection compressors and running at 250 r.p.m. The cylinder diameter is 380 mm. and the stroke 600 mm.

Part of the Galley, Wholly Electrical in Equipment

The Refrigerating Machinery Switchboard, Booster Set and Oil Purifier



The Main Jacket and Piston Cooling Water Pumps

One of the Motors Driving a Turbo-Scavenging Blower

Critical Speeds

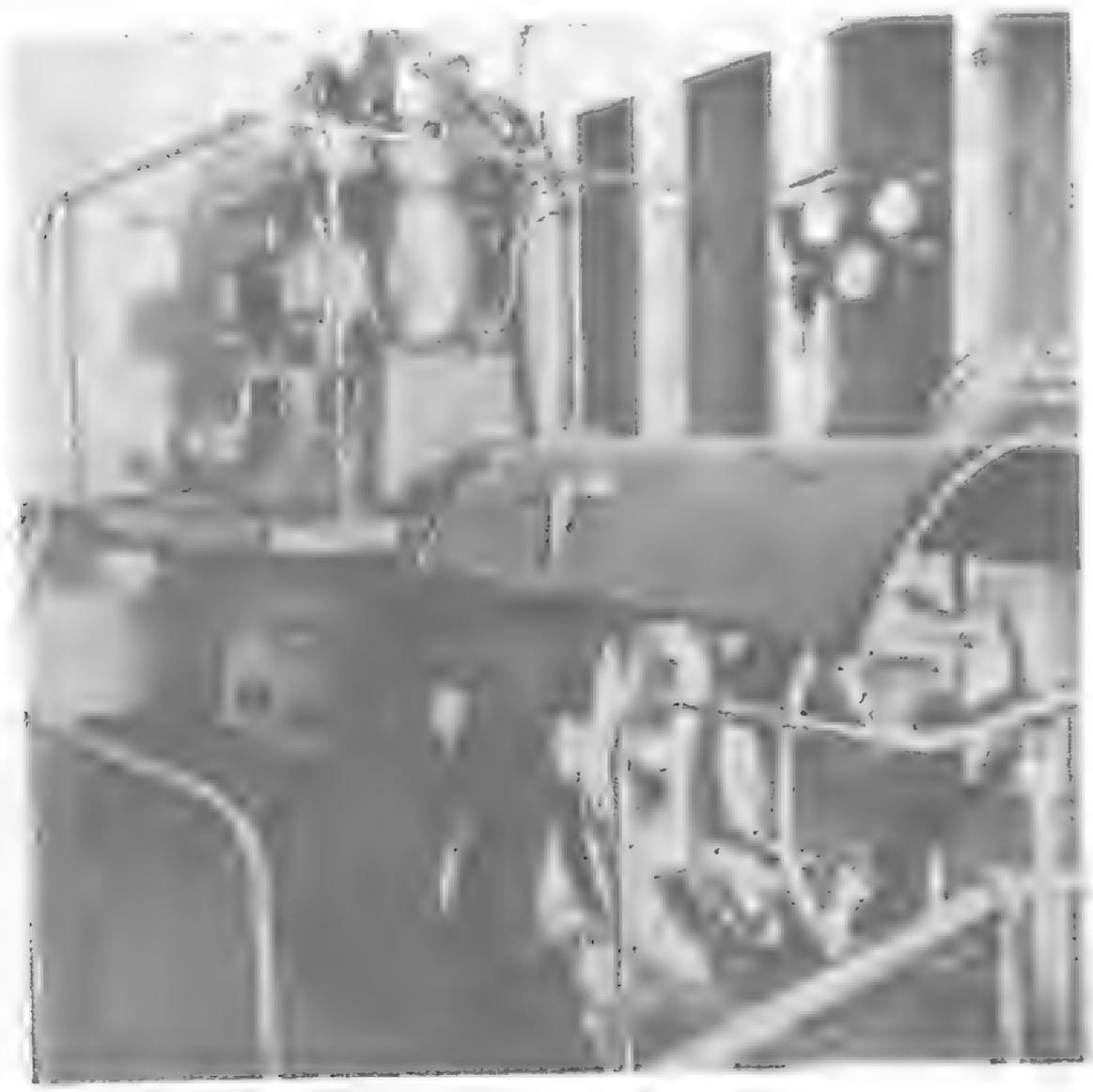
The critical speeds of the main engines have been carefully worked out by the builders. It is desirable to avoid speeds in the following ranges : 30 to 35 r.p.m., 60 to 69 r.p.m., 82 to 86 r.p.m. and 99 to 102 r.p.m. Of these figures only one need be considered to have special importance, namely, 35 r.p.m., the remainder being of minor value. On the trials the absence of vibration was commendable. It may be remarked that the engine bedplate is recessed into the double bottom, which is about 7 ft. in depth. Noting, finally, that salt-water cooling is adopted throughout, both for the pistons and jackets, we may turn to a consideration of the auxiliary plant.

Mercury dial pyrometers are fitted to the exhaust of each cylinder, and these are led down to the top of the crankcase, where the temperatures of both main and auxiliary engines can easily be read.

Generators Wired to Start Auxiliary Circulating Pumps

The main generators are wired in such a manner as to start the auxiliary circulating water pumps automatically. Each of the four machines, two on the starboard side of the engine-room and two to port, has a capacity of 350 kw. and delivers current at 220 volts. There are two turbo-scavenging blowers of the Brown, Boveri type, one supplying both main engines while the other remains as a standby.

Each is rated at 340-kw., the speed range being between 2,200 r.p.m. and 3,000 r.p.m. We observed that the blower in use during the trials appeared to be taking 1,700 amperes. The main switchboard is aft, extending athwart-ships and on the first platform above the floor level. As a matter of fact there are three G.E.C. switchboards in the machinery spaces, for in addition to the main panels (of considerable dimensions) there is an emergency board at the top of the engine-room, together with a large switchboard in the



An Electrically Driven Manoeuvring Air Compressor

A Cargo Winch, of which 28 are Installed

refrigerating machinery space. It may be added that the General Electric Co., has supplied most of the important electrical equipment below and there is a large installation of Brookhirst switch-gear.

The workshop is at the top of the engine room on the port side. It is fitted with a lathe, drilling machine, grinder, shaping machine and a Campell and Isherwood valve-grinding machine for service in connection with the auxiliary Diesel engines. A Cochran oil-fired boiler is installed in the engine-room. Normally, steam will be supplied by a Clarkson exhaust gas-heated boiler taking the exhaust from the auxiliary engines. The Clarkson boiler is also able to receive an oil-firing burner, which, however, was not in place when we were on board.

Oil Purifying Installation

All the centrifugal purifiers are Vickcen machines. Those for use with the main and auxiliary engines are on a special platform on the starboard side of the engine-room. There is a battery of four machines, electrically driven. Two are for fuel alone, one is interchangeable and may be used either for fuel or lubricating oil, while the fourth is reserved for lubricating oil. All are of the enclosed, fumeless pattern.

The fifth purifier is a slightly smaller Vickcen unit in the refrigerating machinery room and the application of a centrifugal separator in this connection is an entirely new departure, so far as can be ascertained. Each refrigerating compressor sump carries about 40 gallons of oil for forced lubrication. The oil is pumped by hand up to a tank, from which it flows to the purifier and, after treatment, is used again for the compressor shaft bearings.

All these separators are, of course, for removing impurities from comparatively large quantities of oil : we may now refer to a totally different system, that of removing a small proportion of oil from bilge water. The latter process is taken care of by a Streamline oily water separator, installed in the engine-room on the port side aft. The separator is arranged in a horizontal position and is of the Hele-Shaw design. We described and illustrated a large installation in our February, 1928 issue ; the unit in the *Tuscan Star*, however, is of the ordinary single-drum type.

Pumping Equipment

Adjacent to the bilge separator is a Drysdale Centrex ballast pump, driven by a 24-28 h.p. shunt-wound motor running at 1,000-1,300 r.p.m. On the same side of the engine-room is a combined circulating and air pump of the Contrex type for the auxiliary condenser. A Quiggins' evaporator is provided. Forward is a Sulzer three-stage motor-driven auxiliary air compressor.

The two auxiliary cooling water pumps are also forward and are coupled to 8 h.p. motors running at 2,100-2,300 r.p.m. Passing towards the starboard side, note may be taken of the feed filter and control tank together with a Brotherhood two-stage steam-driven emergency compressor. There are a feed injector and a feed pump for the boilers, the steam cylinder diameter being 4½ ins., the pump diameter 3 ins. and the stroke 6 ins. A complete set of Fox distance gauges for various tanks in installed in a special container.

The Smokeroom

Chain-driven Pumps

Chain drive for plunger pumps is rapidly finding favor. There are two Weir twin-plunger oil fuel transfer pumps with this form of drive, also a Weir fresh-water pump on the stabroard side and an 8-in. by 7½-in. bilge pump driven by a 15 h.p. motor.

The main cooling water pumps are of the Sulzer centrifugal type. Each set comprises two pumps on the same shaft, one for the pistons and the other for the jackets. There are three installations, making six pumps in all, and each motor is rated at 50 h.p., the speed being 1,200-1,300 r.p.m. The set in use at the time of our inspection was taking 160 amperes of current. On the starboard side forward is an electrically driven auxiliary air compressor (a duplicate of the port machine). Aft of this is an auxiliary cooling water centrifugal pump driven by an 8 h.p. motor. A Drysdale sanitary pump, driven by a 6 h.p. motor running at 1,300-1,700 r.p.m., is provided, together with a larger pump for similar duty, the drive being taken from a 14-15 h.p. motor with a speed of 1;100 r.p.m. Aft is a centrifugal pump for auxiliary cooling water, the motor being of 8 h.p.

A Double-berth Cabin

The Cooling Systems

Between the main engines aft is a Centrex piston cooling-water discharge pump. The motor is compound-wound, rated at 13-15 h.p. and runs at 1,100-1,500 r.p.m. Adjacent is the refrigerator circulating pump, running at the same speed and driven by a 16-18 h.p. motor. The piston cooling water is discharged to a drain tank and pumped overboard by the means indicated, whereas the jacket water may be discharged to a recirculating

system, so that in cold weather the temperature of the water is maintained at the desired degree. Moreover, steam-heating coils are fitted, warm water being circulated in the jackets before the engines are started, if this course is considered desirable.

Fuel Capacity

The fuel capacity is extremely large for the size of the ship. In the double bottoms are carried 1,116 tons, 984 tons in the cross bunkers and 444 tons in the tunnel wing tanks, while the gravity tank capacity is 49 tons, making a total of 2,593 tons. Fuel will be bunkered at St. Vincent for the round voyage and there is, naturally, a very ample margin.

As regards the lubricating oil, there are two double-bottom tanks holding about 10,540 gallons, two gravity tanks holding approximately 3,240 gallons, while in the system are circulated over 10,000 gallons. Six tanks, each holding 600 gallons, are provided for cylinder oil. The fuel consumption will vary somewhat on the outward and homeward runs respectively, but a rough estimate puts the daily expenditure at approximately 38 tons if the engines are developing full power.

Forced Lubricating Oil Pumps

The forced lubricating oil pumps are of the rotary type and consist of two double sets. There is in each case a 45 h.p. shunt-wound motor arranged between two pumps, one for the bearings and the other for the crossheads, the latter being supplied at about 250 lb. per sq. in. Monitor alarms are fitted to warn the engineer on watch if the pressure falls. These alarms are of the whistle type and there are six in all—two for the crossheads, two for the jackets (set at 4 lb. pressure per sq. in.), and two for the piston-cooling systems (set at 15 lb. per sq. in.). The installation is the most complete we have seen on any cargo ship.

The Refrigerating Machinery

By the employment of Diesel engines a marked increase is obtained in the refrigerating space available. The *Tuscan Star* is 15 ft. shorter than a corresponding steamer, has 2 ft. less beam and yet has an increase of 20,000 cubic ft. in the refrigerating space, the total being about 600,000 cubic ft.

The three sets of four-cylinder CO_2 compressors are of Hall's vertical type. They are each coupled to a 145 h.p. electric motor, the maximum speed being 375 r.p.m. The speed of each machine can be reduced by shunt regulation to 280 r.p.m., and any selected machine to 100 r.p.m. by the negative booster.

There are five main 6-in. brine pumps of the upright type, each driven by a 16-18 h.p. motor running at 1,100-1,500 r.p.m. For special work, *i.e.*, assuming a choke in the system, there is a double-plunger pump driven through worm-reduction gear by a 3 h.p. motor by which a pressure up to, say, 100 lb. per sq. in. could be generated at the pump in order to clear an obstruction temporarily affecting the piping. The machinery in the compartment also comprises an upright 2 h.p. motor-driven brine pump for the ship's provisions. The refrigerating engine-room is spacious, airy and well lighted, the whole equipment constituting what is believed to be a record in size for marine service.

Deck Machinery

The steering gear is of the Hastie electro-hydraulic type with four rams arranged athwartships. There are two motors driving the pumps, each of 28 h.p. at 650 r.p.m., shunt-wound and with a full load current of 100 amperes. On the forecastle is a Clarke, Chapman electric windlass with the motor on deck and the contactor gear below. The motor is compound-wound machine rated at 66 h.p., the speed being 750-1,500 r.p.m. The mechanical portion of the windlass is driven through the medium of worm and spur reduction gearing.

For handling the cargo there are no fewer than 28 Clarke, Chapman electric winches. All are identical, being driven by 38 h.p. motors, compound-wound and having a speed of 345 r.p.m. Worm gearing is provided and the winches are silent in operation. The designed speed is 90 ft. per minute for a maximum lift of 5 tons, while the lift is 3 tons at 110 ft. per minute, or 1½ tons at a speed of 220 ft. per minute. The light rope speed of each winch is 450 ft. per minute.

The Electric Galley

It might almost be claimed that the comforts of a passenger liner are provided for the limited number of travellers on this remarkable ship. The galley is spacious and fitted with electric ovens, making a unit of five, each having three degrees of heating controlled by one main and two local switchboards.

The consumption of current when we examined this part of the ship was 150 amperes, but in normal service the galley will at times draw on the electrical supply to the extent of 250 amperes or more, depending on the particular circumstances.

Next to the galley is the bakery, where bread for the use of the officers, crew and passengers will be baked electrically in a large oven. On the opposite side is the scullery. A stairway gives access from the galley to the pantry, which is conveniently located with reference to the dining saloon, and where a capacious electrically warmed service oven is installed.

Passenger Accommodation

The dining saloon is of more than ample dimensions for the purpose. There is a central table, together with armchairs, while separate side tables give facilities for parties of four. Ventilation is assisted by ceiling and wall fans, heating being by semi-enclosed steam radiators. The panelling and furniture are in mahogany and a pleasant feature is the excellent lighting of the apartment. A long, glazed partition separates the saloon from the smokeroom, which is entered through swing doors, whilst access to this apartment is also provided by a door leading from a passageway extending athwart-ships.

Equally well lighted as the saloon and efficiently ventilated, the smokeroom is panelled in mahogany. It is fitted with settees, armchairs, a number of separate tables and a writing desk.

The Cabins

The cabins are aft on the port and starboard sides. The walls are tastefully finished in different shades and give a restful and pleasant effect throughout. Some of these cabins are single-berth apartments, the remainder having two berths. An excellent and quite unusual feature is that on each side one double-berth cabin and one with a single berth have communicating doors with a private bathroom between, making a choicely arranged suite of rooms which would do credit to many a modern passenger liner.

Ship Model Tests

The *Tuscan Star* is fitted with a duct keel and her construction was undertaken after ship-model tests at the Teddington experimental tank. She has fine underwater lines and is fitted with a streamline rudder. While it is true that she is the Blue Star Line's first motor ship, everywhere are to be found signs, not only of experience, but of initiative, and it is plainly apparent that the owners, having decided to take delivery of an oil-engined vessel, determined to specify a ship which should be in many respects second to none in her particular class.

"Tabinta," New Vessel for Dutch East Indies Trade

On March 21, the single screw motor cargo vessel *Tabinta*, building in the yard of the Netherland Shipbuilding Company (Nederlandsche Scheepsbouw-Maatschappij), of Amsterdam, to the order of Messrs. N. V. Stoomvaart Maatschappij Nederland, in Amsterdam, was launched.

The ship is intended for the express cargo service of the said company to the Netherlands East Indies. The principal dimensions are :—length 465 feet, breadth 62 feet, and depth 36 feet 3 inches, and the vessel will have a carrying capacity of about 10,000 tons.

She is of the full scantling type, with forecastle, bridge and poop, and has been specially arranged for the carriage of a large number of pilgrims. There are five holds and a deep tank behind the motor-room. The Lower part of the holds has been specially arranged for the carriage of palm oil. The vessel is equipped with one derrick of 40 tons, one of 20 tons, one of 15 tons, and eleven of three to six tons. A further six cranes are to be erected. The winches and other auxiliaries are all electrically driven.

The vessel is propelled by a Sulzer motor of 7,000 b.h.p., giving the ship a speed of 15 knots. This motor will be mounted by Messrs. the Nederland Graving Docks Company, Limited, (Nederlandsche Dok Maatschappij N. V.), of Amsterdam.

Steam Turbine Lubrication

What it Involves

By H. G. B. PERRY, B Sc. M. E.

THE steam turbine, more than any other type of prime mover, depends upon a perfect lubricant for successful operation. Much of the time lost and many difficulties encountered in turbine operation may be traced directly, or indirectly, to faulty lubrication. To rely on the purchase of the best lubricating oil available is not alone sufficient to ensure the uninterrupted and efficient production of power. It is absolutely essential to provide for the removal of impurities that accumulate in oil during service. Without this provision, the highest grade of oil will deteriorate more rapidly than is necessary. Its value as a lubricating and cooling medium will be lost long before the essential properties of the oil have been seriously impaired. The resulting frequent shut-down of the unit for cleaning and repairs will cause high operating expense and the unnecessary loss of productive time.

The oil in a turbine is subjected to severe operating conditions. It must serve as a lubricant at such points as bearings, couplings, governor mechanism and gears, and as a cooling medium to carry away the heat generated in bearings and gears, and conveyed to the bearings from the steam used in the turbine. As the tendency in steam turbine design is toward higher steam temperatures, operating conditions promise to become even more severe than at present, and to require improved means for maintaining the lubricant in a satisfactory condition at all times. With the constantly increasing demand for electrical power, requiring maximum capacity from available units, it is more than ever essential to reduce the necessity for shut-downs to a minimum.

The oil in a turbine system after a period of service, will invariably contain solid materials, consisting of dust, dirt, erroded metal or metallic oxide particles ; sludge, resulting from chemical changes in the oil ; water ; and emulsions of water and oil, stabilized by the solid materials present. Solid materials and emulsions, deposited in the system, interfere with the proper flow of the oil to and away from the bearings. They clog small internal bearing openings and strainers, reducing the flow of oil at times to a rate that impairs lubrication. Depositing in the oil cooler, they reduce its effectiveness, cause an increased temperature in the oil, and result in more rapid breakdown of the oil. They accumulate in gauge pipes and controlling devices, and hinder the accurate determination of conditions in the lubricating system. When they cover the surfaces of thermometer wells, thermometers fail to show promptly those repid changes in temperature which, if detected, serve to warn the operator of trouble on the system.

Many of the contaminating substances hasten oil decomposition. If they are allowed to remain in the system, oil deterioration takes place at an accelerated rather than at a constant rate.

In addition to promoting oil decomposition and hindering the normal functions of the oil, dust, dirt, metallic particles and water, are, in themselves, the enemies of satisfactory lubrication. The solids are abrasive and contribute to wear of moving parts. Although the amount of these materials is not large in proportion to the volume of oil in the turbine system, nevertheless, the frequency with which the oil circulates means that a small amount of abrasive impurities has a continual wearing effect. The presence of water in the oil leads to the formation of emulsions that are destroyed only with difficulty. The action of emulsions resembles that of sludges in impeding the flow of oil and hindering the proper functioning of the oil at essential points. When the water is present in sufficient amounts to replace oil at bearing surfaces, considerable damage can result, before its presence is discovered.

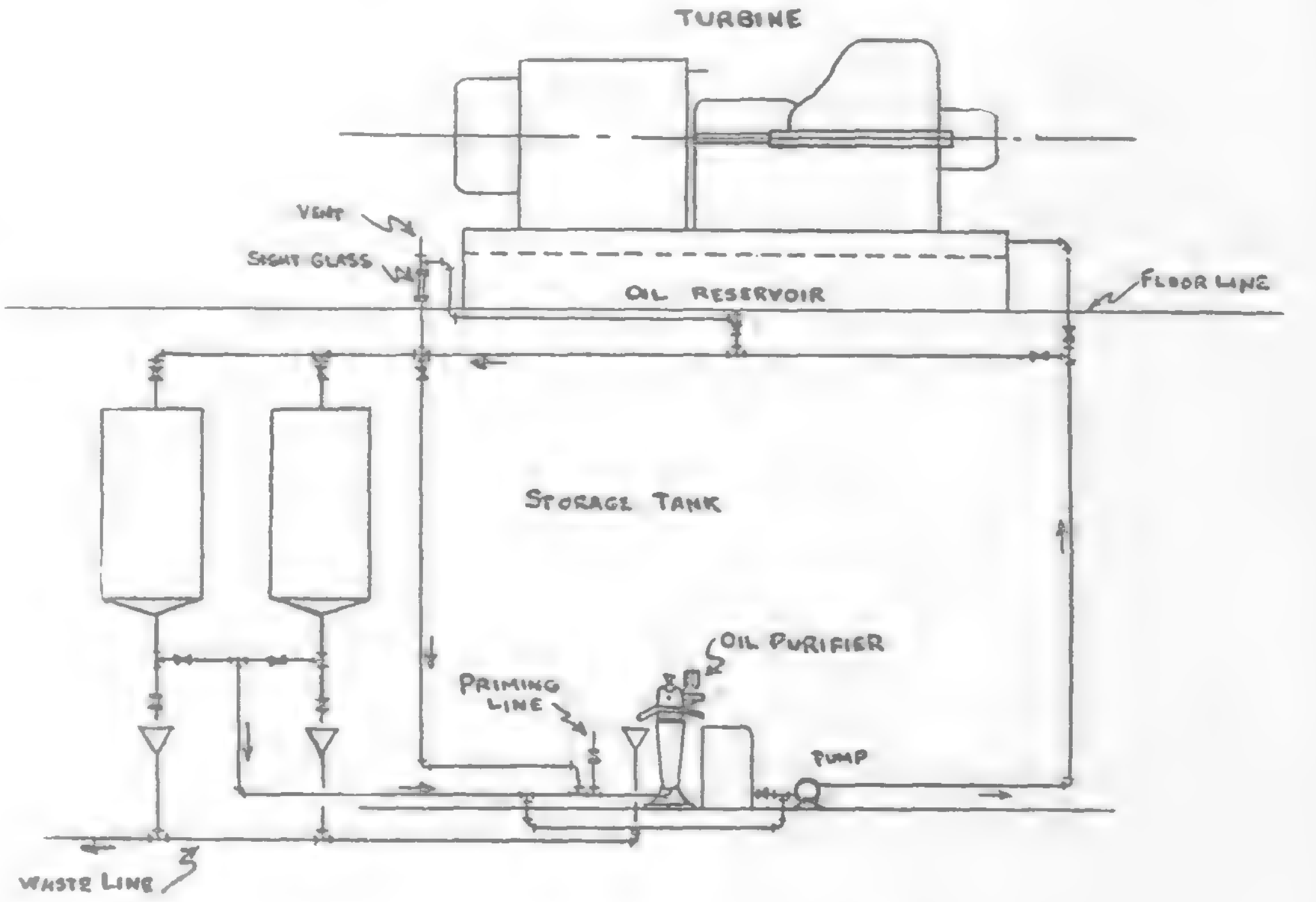
Of the sludge that forms from the decomposition of the oil itself, a portion is soluble and the rest insoluble in the oil at normal operating temperatures. Of the two, the soluble sludge is the more troublesome. For the most part, the insoluble sludge is held in suspension in the oil for a time, at least, and may be removed by diverting a portion of the oil continuously to an efficient purifying device. Under any system of purification other than the pressure-vacuum process, soluble sluge remains in the oil during treatment and is accordingly returned to the system still in solution in the oil which has been by-passed. The centrifugal method is the next most efficient process and is here discussed.

Sludge deposits very gradually at those points in the oil system that are cooler than the oil itself. The greatest precipitation is usually in the oil cooler where it eventually interferes to such an extent with cooling that the unit must be shut down for cleaning.

The centrifugal process for the treatment of turbine oil is a distinct advance in the art of oil purification. It affords an effective and economical method for avoiding the many troubles due to oil deterioration. It partially removes foreign impurities as rapidly as they are introduced, and, at the same time, eliminates those soluble products of oil decomposition that are responsible for many oil troubles.

The Centrifugal Process

The Centrifuge is an integral part of the Centrifugal Process for the treatment of turbine oils. The machine is shown in the accompanying line cut installed with the necessary auxiliary apparatus for the proper operation of the process. In the diagram, the oil flows by gravity to the apparatus placed below the floor on which the turbine rests. The oil, after treatment, is returned by pump



to the oil reservoir. By the proper rearrangement of pumps and piping, the same equipment may be accommodated in any sufficient space available, whether above, on the same level with, or below, the turbine.

It will be recognized from the illustration that the Centrifugal Process makes use of the well-known principle of continuous by-pass treatment of the oil. Oil is drawn continuously from the turbine reservoir, passes through the Centrifuge and is returned to the turbine system again. The oil level in the turbine is not disturbed. Circulation of oil on the by-pass is independent of oil within the turbine system. In this way, interruption of the flow on the by-pass does not interfere with the operation of the turbine.

There has been one objection to the continuous by-pass method of oil purification, as it has been developed up to the present time. Soluble sludge has not been removed from the oil. It is hardly to be expected that the ordinary method of drawing oil from the turbine system at normal operating temperatures and treating the oil at those temperatures will remove this soluble material, yet it is important that provision be made for the removal of the soluble sludge if a purification system is to be entirely successful.

Recognition of the difficulties occasioned by soluble sludge has led engineers to the development of processes for its removal and the Centrifugal process is one of them.

Reference to the diagram will make clear the way in which the Centrifugal process removes soluble sludge. The oil leaving the turbine reservoir is passed to the tank where it is mixed with water at the existing cold water temperature. The mixture then flows to the Centrifuge, where the water and sludge are removed continuously from the oil. The oil returns to the turbine.

The treatment of the oil with cold water precipitates the soluble sludge so that it may be removed by the Centrifuge. After the removal of the precipitated sludge, the oil will no longer form deposits on cool surfaces in the turbine. It has already given up nearly all sludge that will precipitate at the temperature of the cold water supply, and this temperature is below that encountered at any point in the turbine. Furthermore, it is in condition to dissolve the soluble part of the sludge accumulations that may exist in the turbine, thus loosening the truly insoluble materials so that they will be picked up by the oil flow and brought to the Centrifuge for removal. The redissolved sludge in the oil is also removed during the next cycle of the oil through the process.

It is unnecessary to operate the treatment with water continually. After the oil has been purified in this way, some time will elapse before the oil has again developed sufficient soluble sludge to form deposits. The exact time depends largely upon the operating conditions in each individual turbine.

In the intervals between the operation of the process for soluble sludge removal, the oil is passed directly to the Centrifuge without first undergoing treatment in the tank. The operation of the Centrifuge is continuous. It removes from the oil as rapidly as they appear, nearly all the insoluble sludge, metallic particles, dirt, scale and water, instead of allowing their accumulation in the oil. It eliminates emulsions by resolving them into their component parts, oil, which is returned to the turbine, and water, which is run to waste. By the removal of such impurities, it not only insures the turbine against harm from those materials that are abrasive and detrimental to good lubrication, but it also retards the decomposition of the oil, since many of these materials hasten oil break-down. The continuous by-pass method has been endorsed for this purpose by the leading manufacturers of high-grade lubricating oils.

It will be recognized that the Centrifugal Process retains mostly all of the advantages of continuous by-pass treatment. At the same time, the process provides for the periodic treatment of the oil for the removal of the soluble sludge. The Centrifuge is used for either treatment without change. Previous to the development of the Centrifugal Process, batch treatment of oil, with its attendant disadvantages has been necessary for soluble sludge removal. No signle compact equipment has been available to combine continuous by-pass treatment with a process for the elimination of soluble sludge.

In no case is it practicable to pass the entire flow of oil through the Centrifuge. In the ordinary continuous by-pass treatment in connection with large stationary turbines, a flow of from 100-200 gallons per hour is sufficient to maintain the oil in a satisfactory condition. Or it might be put in a different way by saying that the Centrifuge should be capable of handling 10 per cent. of the capacity of the reservoir in from two to four hours.

When operating Centrifuges for the removal of soluble sludge, lower capacities are used. The process should be operated when necessary for about two days' time, or until the amount of sludge removed in the bowl reaches a constant minimum. The treatment with water is then omitted until such time as sludge again requires removal.

However, it must not be inferred that the subjecting of turbine oil to such treatment as has been discussed above is all that is necessary to ensure efficient turbine lubrication. Other factors must be given, such as the selection of the right oil, its quality and ability to act as a heat transferring agent while furnishing effective lubrication in the presence of heavy pressures and high temperatures. One of the most desirable characteristics of turbine lubricating oil is its high degree of resistance to mixing with water.

M.L. "Texaco II"

Motor Launch "Texaco II"

THE above is a Single Screw Teak Motor Launch, built by The Hongkong & Whampoa Dock Co., Ltd., at their Cosmopolitan Dockyard to the order of the Texas Co. (China) Ltd., launched on April 17, 1930.

The following are the dimensions and particulars :—

Length O.A.	60-ft. 1-in.
Length B.P.	55-ft. 0-in.
Breadth Mld.	13-ft. 0-in.
Depth Mld.	6-ft. 0-in.
Mean Draught Loaded	4-ft. 9-in.

The propelling machinery consists of a Gardner 4-cylinder 2-stroke Crude Oil Direct Reversing Engine of the full Diesel Cold Starting Type, developing 72 B.H.P. at 400 R.P.M. Starting and manœuvring is effected by compressed air at 360 lbs.

In addition to the usual air compressor, circulating and bilge pumps fitted on the main engine, a small auxiliary compressing set is provided for the initial charge of the air bottles, and for replenishing the bottles.

A small direct current Crypto Generator for charging a 32-Volt Delco Storage Battery is driven off the main shaft. This set furnishing electric light throughout the launch, and for navigation lights.

The motor seating in engine room is specially strengthened to prevent vibration.

A powerful "Tyfon" Air Operated Whistle is fitted.

The official trials were carried out in Kowloon Bay, Hongkong, on April 30, 1930, the speed attained was 9.353 knots.

The New N.D.L. Express Steamer "Europa;" 51,000 Registered Tonnage; 285 Meters Long, 31 Meters Wide and About 27 Meters High. Accommodations for 2,200 Passengers and a Crew of 1,000

"The Queen of the Seas"

N.D.L. Express Liner "Europa"

WIDESPREAD is the assumption that the two fast liners *Bremen* and *Europa* of the North German Lloyd are quite similar as regards their outer and inner form. This conception is only partly right. If both of them are equal as regards elegance of line, culminating in technical beauty, the minute observer will soon find out, that also the outer shape is somewhat different. The stem of the *Europa* is more bulbeous, thus appearing more compact. The funnels of the *Bremen* are stream-lined, those of the *Europa* oval.

Wholly different however is the interior decoration. This is explained by the fact, that whereas the interior decoration of the First and Second Class of liner *Bremen* was entrusted to different artists and architects, that of the *Europa* is carried out by one architect only Professor Paul Ludwig Troost, Munich. The saloons of the Tourist Third and Third Class have been decorated according to the designs of Klaus Hoffmann and Friedrich Mezger, Hamburg. The decorative scheme of the fast liner *Europa* shows in spite of varieties a pronounced uniformity of style. The impressive composition of line, color and material forms a pleasant harmony. Beauty and expediency have been fused to an expression of elegance, distinction and taste.

The adornment of the *Europa's* social rooms has been entrusted by the North German Lloyd, according to the proposals by Professor Troost, to a number of well-known artists. All of them have given their best. The paintings, sculptures, tapestries etc. in the *Europa* can well represent German art abroad.

In the decoration of the Tourist Third and Third Class every luxury has been omitted, but every stress has been laid on an equipment that combines great comfort and convenience. Just here especially the progress can be seen that the evolution of the last decades has brought to the lower ship classes.

One of the Large Funnels of the N.D.L. S.S. "Europa"

Interior Decoration

1st Class Reception Hall :—Large entrances lead to the 18 m long, two decks high reception Hall, in first class Cuba mahogany wood, furnished with comfortable armchairs. A bronze group by Professor Wackerle representing the *Europa* the symbol of the ship provides a beautiful ornamentation.

Large Dining Saloon :— It accommodates 620 passengers at small tables. Here the color scheme is pale green, decorated with different palisander woods. Four precious tapestries partly worked in silk by Professor Gott, ornament the walls. They depict the Europa-Saga. Tasteful lighting effects are produced by large marble illuminated bowls and invisible lighting alongside the walls and the windows.

Separate Dining Saloons :— Two small dining saloons for private parties flank the large dining saloon : The Schurman Room and the Majolica Room.

The Schurman Room has been dedicated to the sponsor of the ship His Excellency the American Ambassador

Dr. H. C. Schurman. It is decorated by a portrait of the ambassador and a painting of Heidelberg both by Professor Orlik, Berlin. The walls are partly covered with green damask frame with palisander wood.

The Majolica Room has been designed by the Swiss Painter Karl Walser, who has painted German landscapes on tiles.

Lounge :—The social rooms stretch over a length of 160 m. The Lounge has a length of 40 m. The walls are carried out in dark Bahio palisander woods. The curtains are of a deep red in harmony with the upholstery paintings depicting "Morning," "Noon," Evening" and "Night," designed by Professor Arnold decorate the walls. Above the two main entrances bronze crests of Bremen and the United States.

Art Saloon :—The gangway joining Lounge and Library—15 m long and 6 m wide—has been reserved for exhibiting works of art and commercial art on sale on the *Europa*. Here are two portraits of the ship's sponsors Ambassador Schurman and Miss Glassel.

Library and Writing Room :—The library's books are lodged in large bookcases in light walnut wood, with gilt edges. Grey matt finished varnish covers the walls of the library which is ornamented with four busts of Kant, Emerson, Goethe and Whitman.

Ballroom, Design: Professor Troost. A small foyer with capricious wall paintings of Professor Heubner, representing scenes of Shakespeare's Midsummer Nights Dream, leads from the Library to the ballroom, where the color scheme is ivory, gold and pale blue, with mosaic parquet dance floor in French walnut. Boxes lined with blue damask are at each side of the ballroom. The furniture is of palisander wood, the chairs are covered with tapestry from the Tapestry Manufacture Munich. A stage, in the background of which is a fine tapestry representing a scene from Mozart's Magic Flute designed by A. Hagel and cinema installation complete the equipment. Four bas-reliefs by Professor Wackerle depicting modern dancing are decorating the walls. Two bars are adjacent to the ball room.

Smoke Room :—This saloon is situated in the ship's fore part. Ebony wood and parchment cover the walls and give an atmosphere of quaintness and cosiness. There are two large fireplaces in "rouge antique" marble and onyx, mounted by two paintings by Professor O. Dill. "Hunting Day" and "Polo-play." Hunting and sport are also the motifs chosen by the American artist Kathe v. Dombrowski for her characteristic drawings. A bas relief "Bull's Fight" carved in red wood by Karl Remois, provides additional ornamentation of the walls. Pale red curtains decorate the windows and are in harmony with the pale red upholstery of the chairs round the fireplaces.

The forward part of the promenade deck, embracing the smoke room in a width of about 6 m. is turned into a winter garden, decorated in light green matt finished varnish and equipped with quaint exotic plants and wicker work furniture.

Children's Play Room :—Near the Main Entrance Hall is the children's play room, painted according to the design of Max Schwarzer. The figures are partly movable and will be an amusing toy for the children. A punch and judy show will divert the young passengers.

Sun Deck Restaurant :—On the top deck is the sun-deck restaurant provided especially for those passengers whose passage money does not include meals. The reception room of this restaurant is decorated in light matt finished varnish with gilt ornaments and colored friezes. Yellow curtains in Italian brocade frame the large windows, which give a lovely view on the ocean. Wall-paintings by Professor L. Bechstein representing "Arcadian Idylls" decorate the walls.

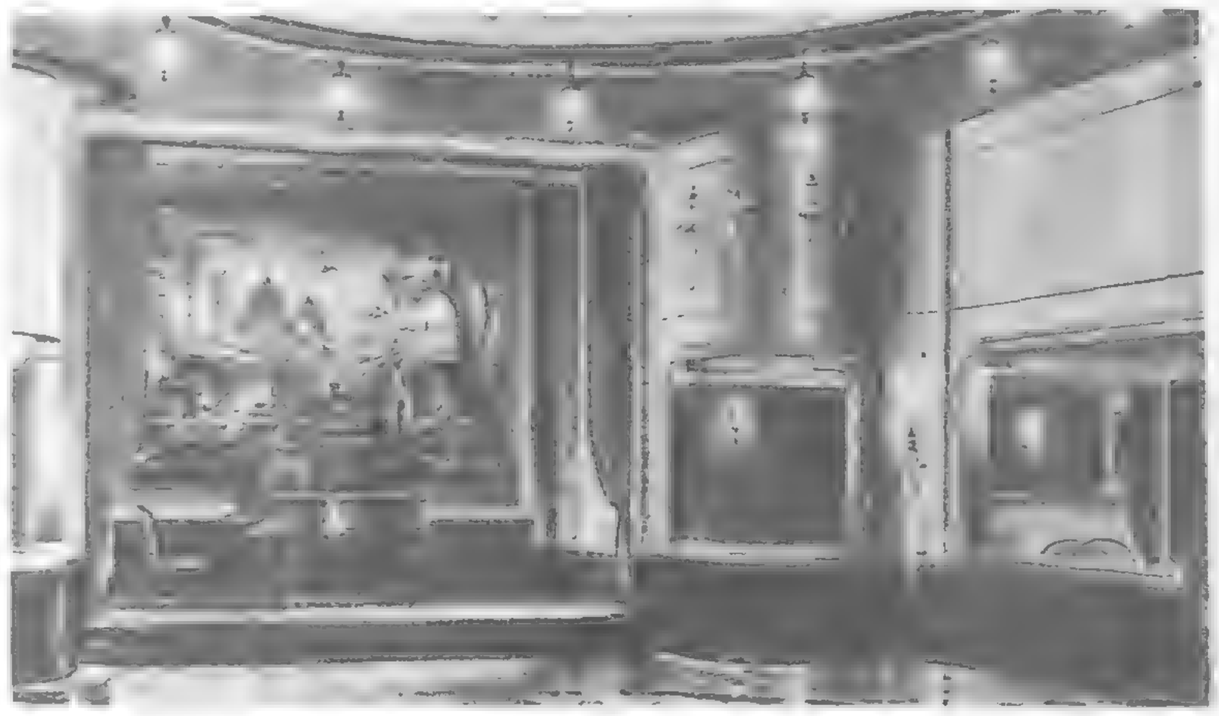
Beautiful woods ornament the restaurant, which has four separate small box-like rooms for private parties lined with damask and decorated by

N.D.L. Express Steamship "Europa:" Top; View on, Boat Deck. The Ship is equipped with large unsinkable life boats, all Motor propelled. There are 38 boats in all providing ample accommodation for all passengers and the crew. Left Bottom, Art Saloon where valuable works of art for sale on board are exhibited; Right, One of the First Class Cabins

Grand Hall

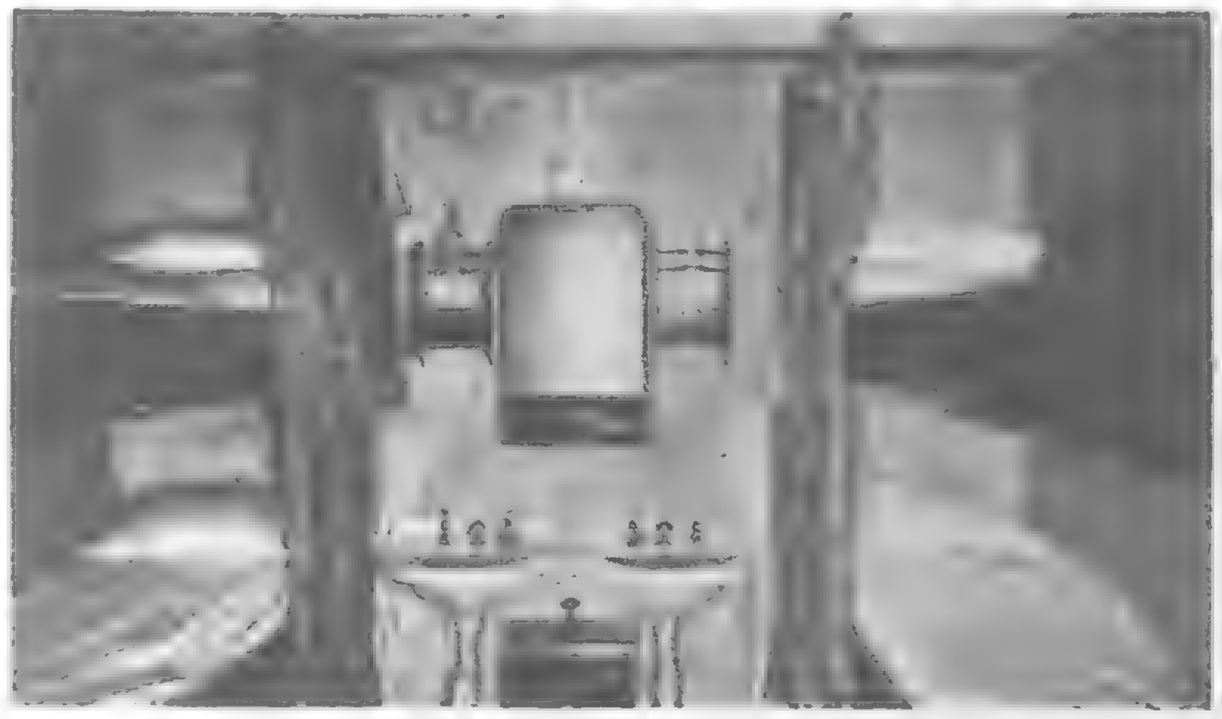
First Class Dining Saloon

Cabin-de-Luxe



Ball Room

Second Class Cabin



Third Class Tourist Cabin

paintings of Professor Angelo Jank and Professor E. T. Tony. Quaint lighting effects are produced by illuminating devices in marble.

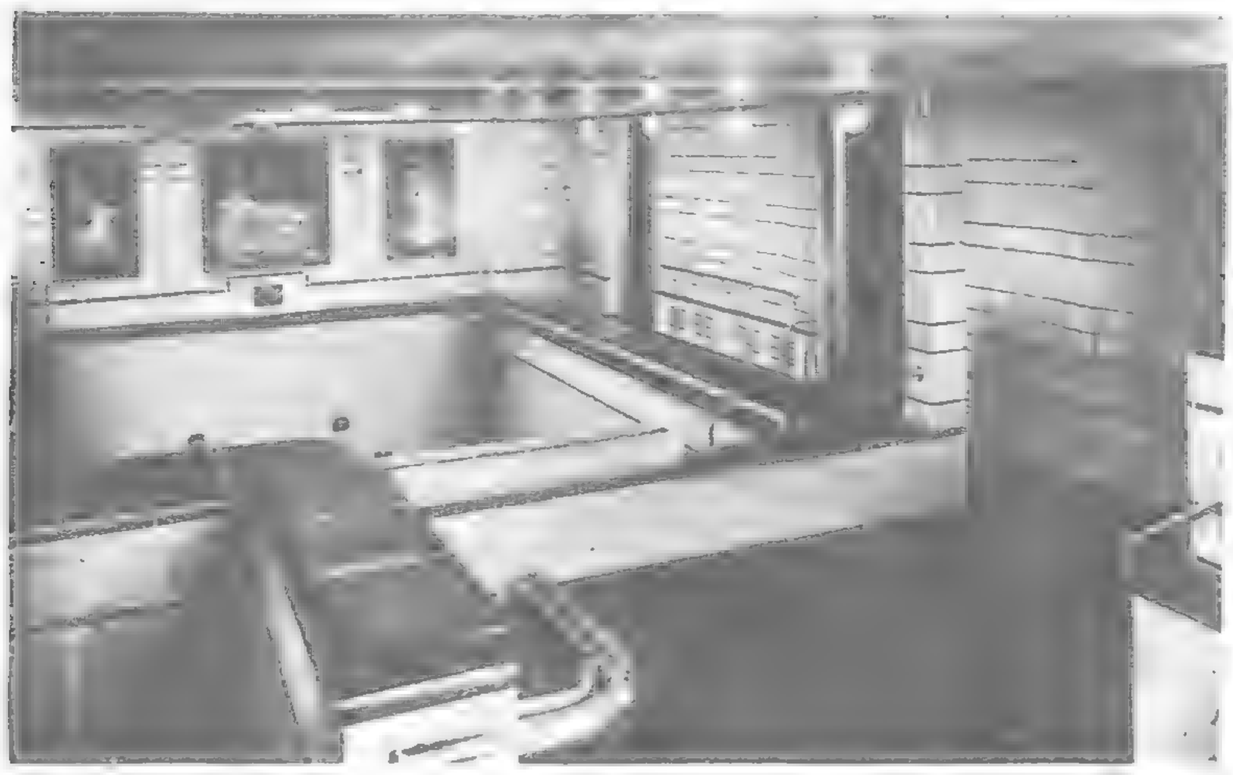
Swimming Bath:—The swimming bath is lined with light colored tiles. The tiles of the pool are blue green. Three gaily colored mosaics designed by Professor Hans Gott representing mythological scenes: "The beautiful Galathea." "Triton" and "Najade." A charming fountain showing children riding on a dolphin designed by E. Henke, provides additional ornamentation.

Third Class Dining Saloon

Luxury cabins and cabins:—The luxury cabin suites include ante room, living room and bed room with separate bath. Exquisite woods and silks have been used for their decoration and furnishing.

Second Class

Dining Saloon:—The dining saloon is in its entire part built through two decks thus reaching a height of approx. 5.50 m. Yellow enamel with red edges and gold covers the walls which are ornamented with paintings by Professor M. Unold representing scenes of Odysseus'



First Class Swimming Pool

wanderings. Wood carvings by E. Henke set in gold, showing the four elements are a further means of decoration. Passages joining the main saloon with the side rooms are decorated by landscapes designed by Professor Julius Hess.

Lounge :—The color scheme is grey-green, dark green and terra cotta. 12 large windows give full light to the tasteful saloon. Two walls are adorned with mosaics designed by M. Schwarzer and form a pretty background for two bronze groups "Dance" and "Music," cast after models by H. Geibel. The ceiling is decorated by three bas-relief carvings by Knut Anderson. A dance parquet is provided for in the center of the lounge.

Verandah :—The verandah adjoining the lounge has four large glass doors leading to the promenade deck. It is furnished with wicker chairs and tables and cheerfully adorned with landscapes by O. Hirth. Above the doors are hunting and fishing scenes by the same artist.

Ladies Saloon :—This saloon, divided into three parts, serves as writing room and library as well. The walls are covered with striped damask, the curtains being of the same material. Creme colored matt finished varnish is used as finishing. Chandeliers with yellow silk give a warm and beautiful light. Drawings and paintings adorn the walls.

Smoke Room :—The walls of the smoke room are done in olive grain wood and colored matt finished varnish giving a note of comfort and coziness. The 12 colored windows are framed by yellow curtains. Close to the smoke room is a bar partly decorated in leather and matt finished varnish. The paintings which adorn the walls are by A. Kessler—Godramstein "Vintage in the Palatine" and "Mountain Scene in the Vosges."

Children's Play Room :—The children's play room is furnished with a marionette theater. The room is kept in pale blue with wall paintings by Elisabeth Jager, and has a cheerful note that will appeal to the youthful mind.

Dining Saloon :—The note of this saloon is bright, the walls being covered with light blue-green matt finished varnish. Pale yellow lampshades and bright linen toned in grey, blue and white, surrounding the windows, give a pleasant note.

Lounge :—This is very warm and comfortable saloon the decoration being carried out in polished pear wood. This is toned a light red and tastefully contrasted by the upholstery, ranging from green to orange. The carpet in its center part is detachable for dancing.

On one side, behind two doors an altar is arranged for both confessions. The walls are in light colored enamel with gild ornaments depicting clerical motifs. A piano and a harmonium are provided.

Smoke Room :—This saloon has a special aspect of comfort and coziness. This effect is produced by tobacco colored woods. Red color is introduced in the colored linen decorating the windows and in the leather upholstery of the comfortable armchairs. A large bookcase and writing desks are provided.

Third Class

Dining Saloon :—The walls are carried out in light coloring. Ivory enamel finished off with borders of polished mahogany give liveliness and brightness. The arm chairs are in mahogany upholstered in brown leather.

Hall :—An attractive decoration is provided by polished mahogany. The comfortable armchairs are upholstered with brown velvet. The carpet in its center part, is detachable for dancing.

Smoke Room :—The walls and parts of the ceiling are carried out in tobacco colored oakwood. Armchairs and tables are of the same material.

Ladies Saloon :—The decoration of the ladies' saloon is carried out in pearwood of a light red tone. The gay curtains are white and blue. Blue is also the upholstery of the chairs and the carpet.

Technical Data

Dimensions :—*Europa* has a length of approx. 285 m (936 ft.) a breadth of approx. 31 m (101ft.) and a height from the lowest part midship to the upper promenade deck 27.2 m (88 ft.)

Anchor :—The ship is equipped with three anchors. Each of these anchors weighs 15.000 kg., is 5,5 m high and 4 m wide.

Commission :—Order for the *Europa* was given together with that for the fast liner *Bremen* in December 1926.

Equipment and Decoration :—The equipment and decoration of the liner has been entrusted to firms in all parts of Germany.

Laying of the Keel :—The keel was laid July 23, 1927, at the Dockyard Blohm and Voss, Hamburg.

Decks :—Passengers of all classes have ample deck space at their disposal. The closed promenade deck of the I. class has a length of 358 m. If a passenger has gone round this deck three times he has covered one kilometer.

Speed :—The speed of the *Europa* will enable the ship to travel from Bremen to New York in six, from the Channel Harbors in five days.

Tonnage :—Liner *Europa* has a tonnage of approx. 50,000 register tons gross.

The Classes

Classes :—Fast liner *Europa* can accommodate passengers in the First, Second, Tourist Third and Third Class. The First Class can lodge up to 800 passengers, the Second Class up to 500 passengers. Tourist Third has accommodation for 300 passengers, the number of which can be enlarged to 500 by making use of parts of the accommodation of the Second Class. The Third Class' accommodation is for 600 passengers. The number of passengers for all classes amount to 2,200.

Machinery

Propelling Machinery and Boilers. The boiler plant is split up into two main groups very widely apart, as may be seen from the great distance between the two funnels. This offers next to certain other advantages the great advantage that even in case of a severe collision one of the main boiler groups will always be intact, meaning that the ship could in such a case continue the trip under own power. The *Eucrpa* is propelled by four single reduction geared steam turbines of the reaction type acting on four screws. The four independent turbines, and gearing aggregates are accommodated in two separate main engine-rooms with a water-tight bulkhead between. Abaft of the main engine-room there is a large auxiliary engine room containing mainly the large diesel electric generators and the distribution switch boards.

To produce highest economy the machinery and boiler plant have been equipped with the newest controlling and measuring apparatuses. A staff of 30 engineers and a large number of assistant engineers, electricians. mechanics etc. are supervising the plant.

In case of need for repairs a fully equipped workshop is provided.

The steam necessary for the turbines and the auxi-engines is pumped through the condensers boilers with oil firing. To condense the steam in order to supply new feeding-water, hourly 30,000 tons of cooling water are pumped through the condensers.

The large Diesel electric generators have to drive approx. 420 electro motors, thus propelling the same number of auxiliary engines. 1.500,000 cbm. of air have to be set in motion for the large ventilation system. Totally independent of the huge electrical plant down below in the ship's engine-rooms, are two large compressorless emergency Diesel dynamos, which can, in case of need, supply the necessary electric current.

Masts :—Each of the two masts of the *Europa* has a height of 72 m.

Medicinal Baths :—A large series of up-to-date medicinal and hygienic baths are at the swimming pool. Every form of electric bath is provided for, from galvanic. Faradic etc. Also a special violet ray apparatus is available. Special spray and douche compartments massage rooms, vapor and rest rooms are further available thus providing for every form of hydrotherapeutical treatment.

Crew :—The total number of crew including officers is approximately 975.

Oil-Provision :—To provide the oil necessary for combustion on the trio of fast liners *Bremen*, *Europa* and *Columbus*, the German-American Petrol Company has erected near the Columbus Kay, Bremerhaven, a large bunker plant, which can credit itself on being one of the largest in Europe. It overs 12,000 qm. The 5,000 tons of oil necessary for the trip Bremen-New York can be filled into the ship in a comparatively short time. Liner *Bremen* for example received before her second trip to America 5,000 tons of combustion oil and 100 tons of Standard-Driving Oil, within 7 hrs.

Navigation Bridge :—The main navigation bridge of liner *Europa* and the navigation house as also the rooms for wireless telegraphy are located on the upper sun deck. To facilitate navigation the ship is fitted with another bridge midship and one aft. Film-Performances and Photography.

S.S. *Europa* is equipped with four bronze screws each of which is cast in one piece, weighing 14,000 kg.

The main axes of the two elliptically shaped funnels are 18 by 7 m. The Liner *Europa* has Frahm Anti rolling tanks to deaden the rolling movement of the ship.

Safety Devices

The safety devices on the S.S. *Europa* represent the latest word in technique. The ship has a double bottom running fore and aft. for the full length of the hull and the vessel is sub-divided into 15 water-tight compartments by 14 bulkheads. Flooding calculations are based upon the ship being able to remain safely afloat if any two adjacent compartments should be simultaneously flooded. If three adjacent compartments at the stern should be simultaneously flooded, or if four adjacent compartments at the bow the ship would still remain afloat.

In spite of these first class safety devices special stress has been laid on equipping the liner with large unsinkable lifeboats. All of the lifeboats are motor propelled. The engine fitted watertight also works if the boat is full of water. The capacity of the boats (each holds 145 persons) is so great that accommodation is provided for all passengers and the crew. The boats can be lowered very quickly. They are slung in Welin-Maclachlar davits, which guarantees quick and safe lowering.

In the same way as liner *Bremen* the *Europa* is equipped with an extensive foam extinguisher, fire pumps which can pump 1,300 cbm of water per hour and a large carbon dioxide plant. The other safety devices such as the alarm signals, wireless telegraphy installation, navigational auxiliaries, as submarine sound receivers, directional wireless etc. are all in accordance with the latest practice.

With the constant technical progress also the signal installations show many innovations, These apparatus are worked with electricity on *Bremen* and *Europa*. Most of these installations are located on the bridge, in the wheelhouse and chartroom, thus enabling the ship's command to transfer their commands and orders to the remotest parts of the large ship and to exercise constant control over all apparatuses essential for the ship's working order. Commands are transmitted by electrically moved indicators.

A modern telephone plant is fitted throughout the ship.

Typhones, Sirens and the fog bell give automatic signals of a certain length at fixed intervals in case of fog by switching on an electric switch.

Japan's New Ammonium Sulphate Process

The Showa Fertiliser Co., the name of the new Japanese ammonium merger, is expected to use in its production of sulphate of ammonia the Shibata patent owned by the Department of Commerce and Industry. It is estimated that this process will enable the company to produce a ton of ammonia at a cost of Y.60, thus effecting considerable savings in eliminating royalty to foreign owners of existing patents.

Electrically Driven Cotton Mills in China

(Continued from page 363).

All the necessary cables to connect up the above-mentioned motors to the main switchboard are paper-insulated, lead-covered, asphalted jute served cable with double iron taped armoring and jute covering. These cables were also ordered from the AEG Cable Factory.

Tangshan Mill

The Tangshan Mill has lately started a Weaving section of of 250 looms manufactured by Henry Livesey. It is the first weaving plant in China to adopt the AEG weaving mill motors, in connection with individual geared loom drive. The complete equipment delivered to the Tangshan Mill by the AEG comprises :

1 high-tension transformer, 200 kVA, 2,200/440 V, 25 cycles,

1 complete high and low tension marble switchboard with four outgoing feeders,

260 AEG three-phase loom motors, 0.6 H.P., 440 V, 25 cycles, complete with coupling gear and pedestals for the motors, including special loom switches.

Furthermore, the AEG supplied to this mill :

All motors for the individual drive of the preparatory machines such as Dobby looms, size mixing apparatus, Slasher sizing machines, hydraulic cloth press, Leesona winding and shearing machines and calender, and the complete lighting and power plant.

The power required for the Tangshan Spinning Mill amounts to about 1,500 H.P. and 25,000 Spindles are put into operation. The necessary raw material is supplied from various provinces and cotton centers.

Special villages and living quarters have been built for the accommodation of the workers. The mills are controlled on the most modern, efficient and scientific lines. Clubs, schools and libraries are provided for the staff and workpeople. The fair treatment of the employees by the management has resulted in an atmosphere of contentment.

There are other mills in the towns where the Wah Shing Cotton Mills are operating, and consequently competition is very keen but with its effective administration and strong financial backing, the Wah Shing Cotton Mills have been able to make steady progress.

J. G. JAUCH.

S.M.R. Electrical Extensions

THE South Manchuria Electricity Co. will expend Y.3,000,000 on its plants during the current fiscal year.

For the extension of the Amanogawa power house and on the Hoshigaura tram line, Y.600,000 is to be laid out. The work is to be completed in the next year by an additional Y.900,000.

The installation of the new 15,000 kilowatts generators is nearing completion, and will be ready for operation about July.

The old Hamacho power house is to be practically closed up, when the proposed extension work is finished. The old 5,000 kilowatt generator in Hamacho is to be shipped to Antung to be installed at the power-house there, after the new 15,000 kilowatt generator is operating.

The tall chimney in Hamacho, one of the chief landmarks handed down from the Russian régime and often spoken of as the tallest in the Orient, seems doomed to extinction.

The total enterprise funds of the Electricity Co. for the new fiscal year amount to Y.2,200,000, inclusive of Y.600,000 for the power transmitters from Amanogawa to Terauchi-dori ; Kasuga-cho ; Y.400,000 for additional indoor and outdoor wirings ; Y.180,000 for replacement of tram rails ; Y.70,000 for eight new buses ; Y.100,-000 for miscellaneous works ; and Y.200,000 for reserve fund.

If, to the above, the power transmitters between Ssupingkai and Kungchuling, between Tiehling and Kaiyuan, and to Kanchingtzu, the seat of the new coal pier across the Bay, all continued from the preceding year, are added up, the grand total will exceed Y.3,000,000.

Motorship "Kohwa Maru"

Built at the Uraga Dockyard, Japan

THE Uraga Dockyard has recently completed, an interesting single-screw M.A.N.-engined motorship of 9,120 tons d.w. capacity. This vessel, ordered by the Shohwa Kisen Kaisha is built on a new system of framing developed by the head designer of the builders.

The vessel has been built to the highest class of the British Corporation and the Imperial Japanese Marine Corporation. She is provided with four cargo holds; only a few center line pillars are fitted in the holds, thus permitting the carriage of timber of considerable length. The electrically-driven cargo winches are all fitted on elevated paltforms, so that both the forward and the after wells are entirely clear and well adapted for the carriage of deck cargoes. The double bottom tanks and fore peak tank have been arranged to carry fuel oil or water ballast alternatively, while the portion under engine room has been subdivided and constructed to carry fresh water and lubricating oil, and after peak to carry fresh water for domestic purposes. The total capacity of oil fuel tanks is over 1,300 tons.

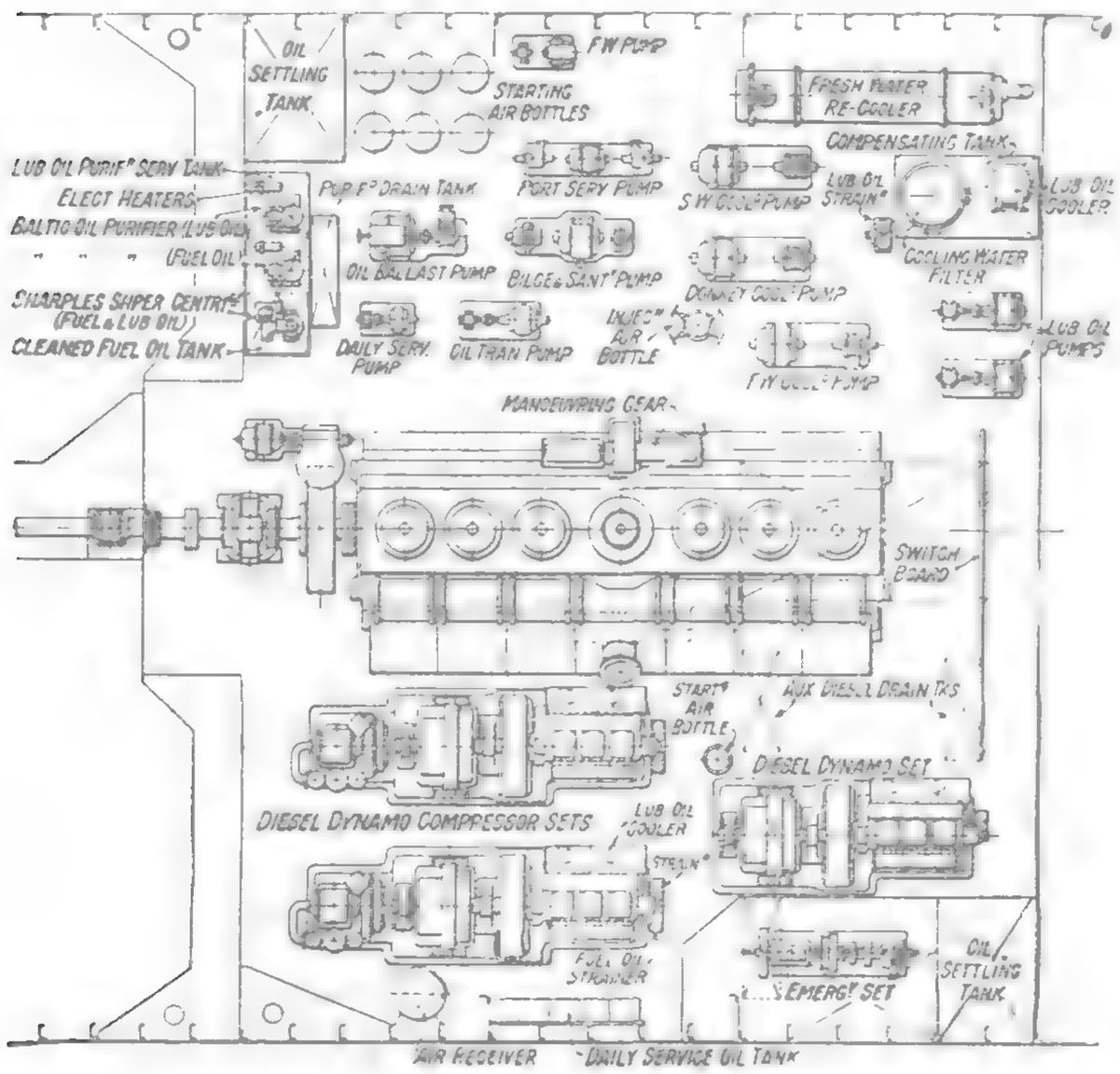
Motor Ship "Kohwa Maru"

Very efficient cargo-handling appliances have been provided, twelve tubular derrick booms being arranged to load and discharge cargo through six large hatchways, all 20-ft. wide and of various lengths, with the aid of 12 electric winches. The two winches on the poop deck are of spur geared type of Metropolitan-Vickers' make, while the others are worm geared winches by Laurence Scott and Electro-Motors Limited. Two of the cargo derricks can lift up to eight tons, while others are of five tons lifting capacity. There is a powerful electric windlass of Uraga make, the electric motor for the same being placed under forescastle deck, free from the effect of weather and sea. The steering gear has also been manufactured by Uraga Company. The gear is of the all-electric type and is controlled on the Ward Leonard System, the steering gear having been supplied by the Siemens Schuckert Company of Germany.

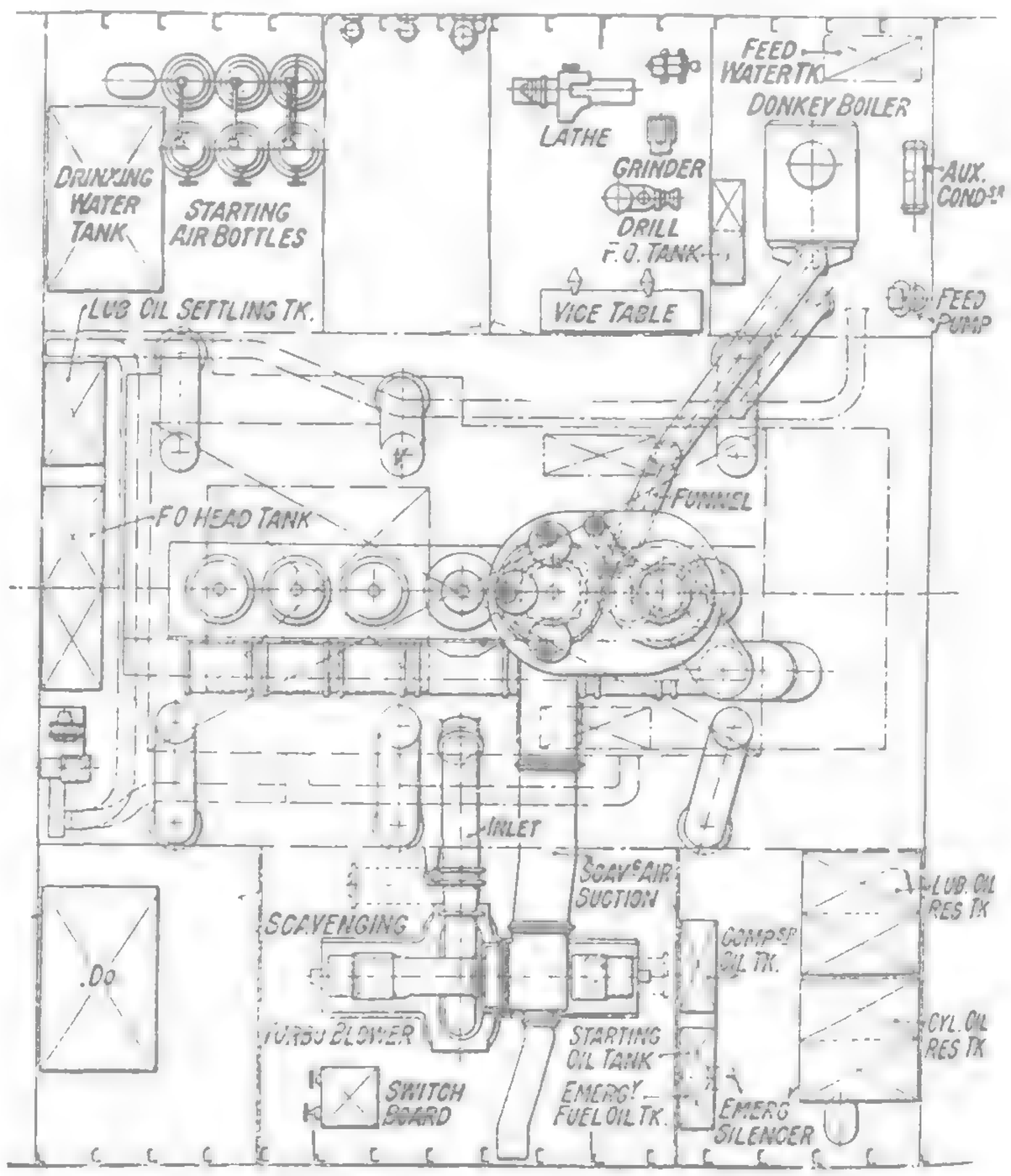
Propelling Machinery

The propelling machinery, constructed by the Maschinefabrik Augsburg-Nurnburg (M.A.N.) at their Augsburg Works, consists of a six-cylinder, air injection, double-acting two-stroke cycle Diesel engine. The cylinders are 600 mm. in diameter with a piston stroke of 900 mm., and the engine develops 3,200 B.H.P. at a normal speed of 107 r.p.m., being capable of a 20 per cent. overload at 116 r.p.m. Scavenging air for the engine, which is illustrated with this article, is supplied by an electrically-driven turbo-blower. The auxiliary machinery is all electrically driven.

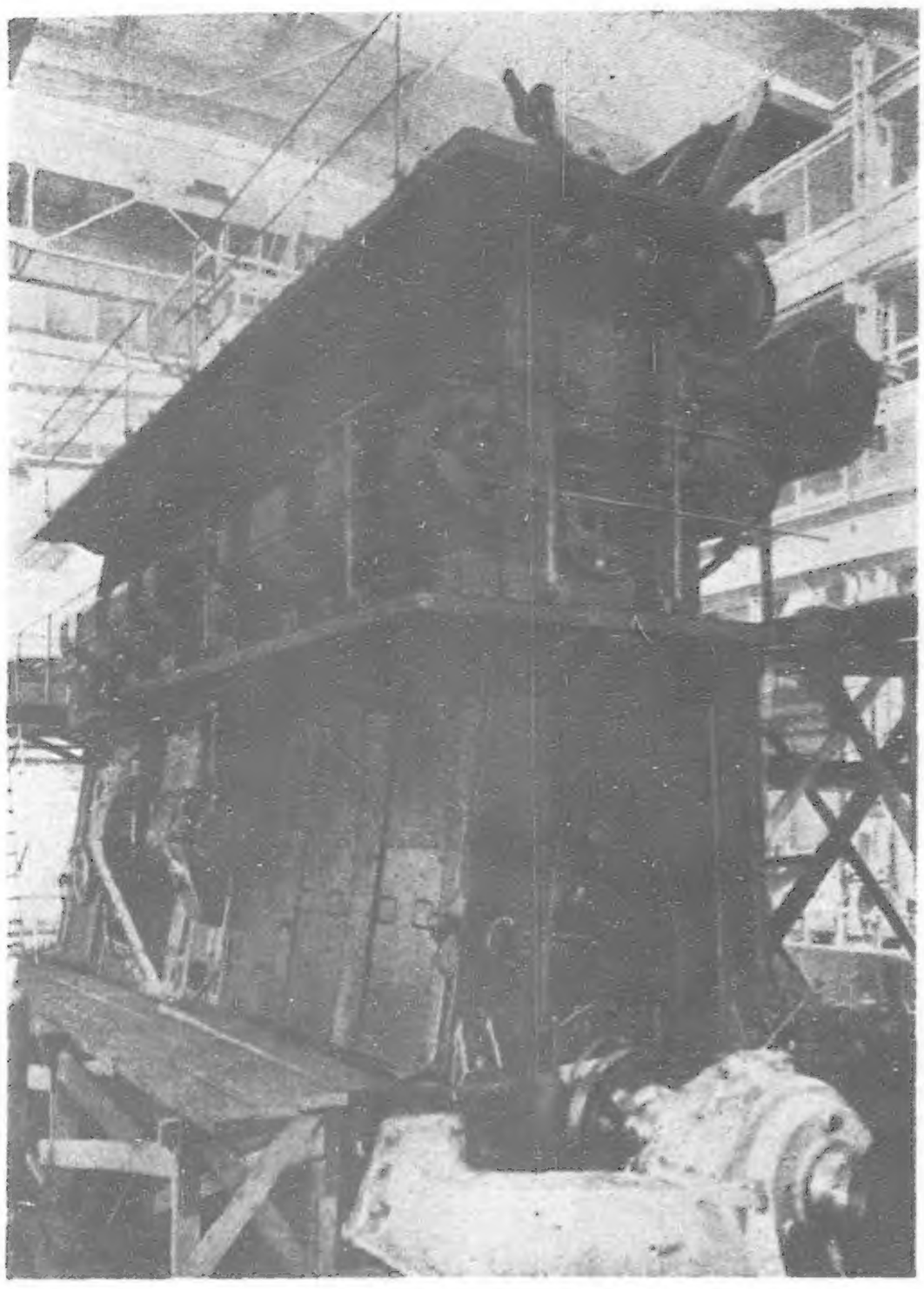
For supplying electricity for operating the auxiliaries and for other purposes on board, there are three 175 B.P.H. Diesel-driven generating sets, two of these being combined dynamo and air compressor sets, the dynamo developing 115 KW. at a pressure of 230 volts, the compressor having a capacity of 335 cub. m. per hour, at a pressure of 75 atmospheres, the engine having a speed of 375 r.p.m. The engines are of the four-stroke cycle trunk-piston airless-injection type, and are of M.A.N. manufacture. The other set has a generator of exactly the same size, but is not provided with a compressor. In addition there is an



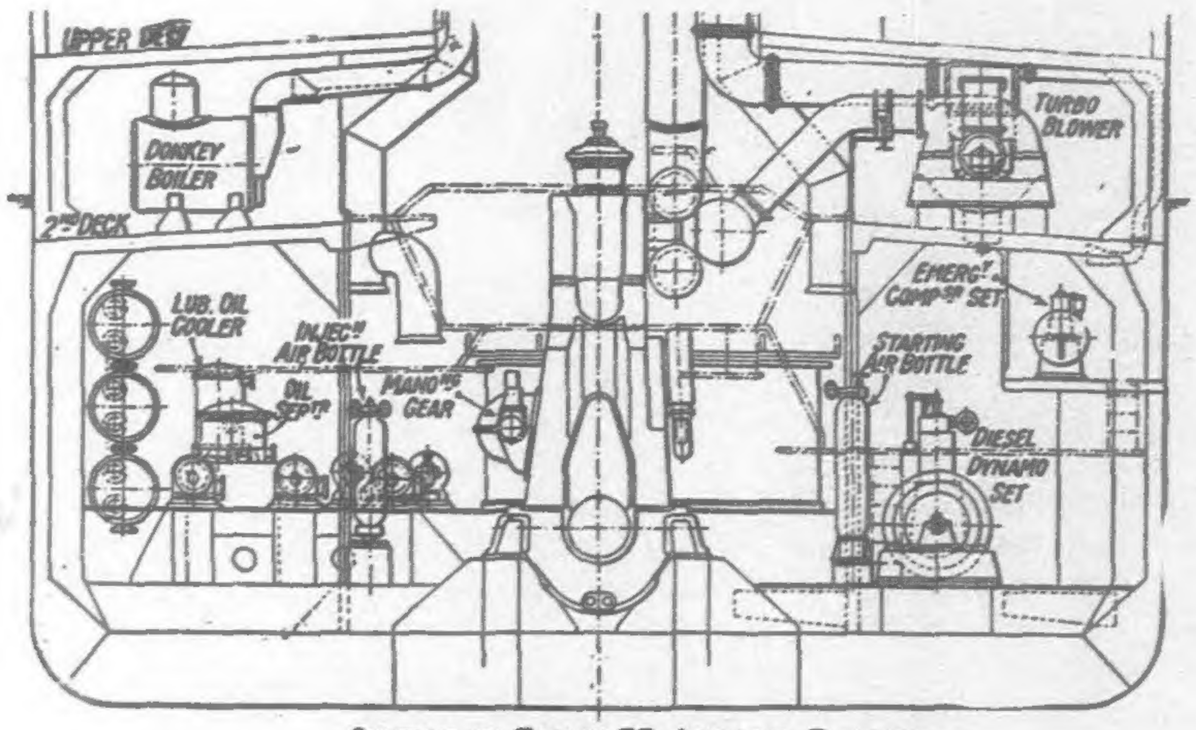
Engine Room Arrangement of the "Kohwa Maru"



Plan of Engine Room at Second Deck



Main Engine of the "Kohwa Maru" on the Test Bed at Augsberg



SECTION AT FRAME 73. LOOKING FORWARD

Section Through Engine Room of "Kohwa Maru," Showing Location of Scavenging Blowers

emergency dynamo and compressor set of 7 KW. and 15 cub. m. capacity.

The vessel ran a comprehensive series of trial trips before being handed over to the owners, during which every part of the main and auxiliary machinery worked without any trouble of any kind, no excessive vibration being observed on board throughout the trials. Owing to the good design of the screw propeller and also the good stern arrangement, as mentioned earlier, the propulsive efficiency of the ship was found to be very high. At the ballast draught, with about 6,300 tons displacement, and with 5 per cent. overload on the engine, the average propulsive efficiency at the speed of 14.52 knots was found to be 69 per cent. The rate of fuel consumption at full power was well under the builders' guarantee, namely, 186 gr. per B.H.P. per hour, including the consumption of the auxiliary engines. The propeller is of the four-bladed built-up type with cast-iron boss and manganese bronze blades, 15-ft. diameter, with a pitch of 13-ft. 10-in., the developed area of blades being 67.5 sq. ft.

The principal dimensions of the vessel are as follow :—

Length, b.p.	415-ft.
Breadth, moulded	56-ft.
Depth, moulded	31-ft. 9-in.
Deadweight	9,120 tons
Load draught	25-ft. 3½-in.
Gross tonnage	5,847 tons
Sea speed, fully loaded	12½ knots
Normal machinery power	3,200 B.H.P.
Cargo capacity (bales)...	462,000 cub. ft.

The keel of the ship was laid on October 5, 1928, the ship was launched on March 11, 1929, and handed over to the owners on June 27. The ship left Yokohama in ballast condition on July 3 for America and arrived at British Columbia on the 16th, the average speed for the whole voyage being 13.4 knots, the daily fuel oil consumption being about 12 tons, the mean displacement being about 6,200 tons. On the homeward voyage to Yokohama, with a full cargo of timber and a mean displacement of approximately 12,500 tons, the average speed for the whole voyage was 12.2 knots, and the daily consumption for all purposes was 14.7 tons of Californian fuel oil of common grade.

"Talisse," A New Motorship Launched for Far East Trade

The Caledon Shipbuilding & Engineering Company, Limited, launched on February 14, the motor vessel *Talisse*. The *Talisse* has been built to the order of the Stoomvaart Maatschippij Nederland, Amsterdam, and is of the following dimensions :—

Length, between perpendiculars 465 feet, breadth moulded 62 feet, depth moulded 36 feet 3 inches, and gross tonage approximates 8,000 tons. The vessel, which has been built to Lloyd's Register of Shipping, the Dutch "Scheepvaart Inspectie," the Dutch requirements for the crew accommodation, and the Dutch requirements for the safety of stevedores, has been specially designed for trade in the Far East, and arrangements have been made for the carriage of pilgrims. The vessel is divided into six main holds, one of which has been constructed to serve as a deep tank, and the cargo loading and discharging appliances are of a very complete nature. There are 14 derricks, with a range of lifts from three tons to 40 tons, and these are operated by 11 electric winches of special design supplied by Messrs. Laurance Scott & Company, Limited.

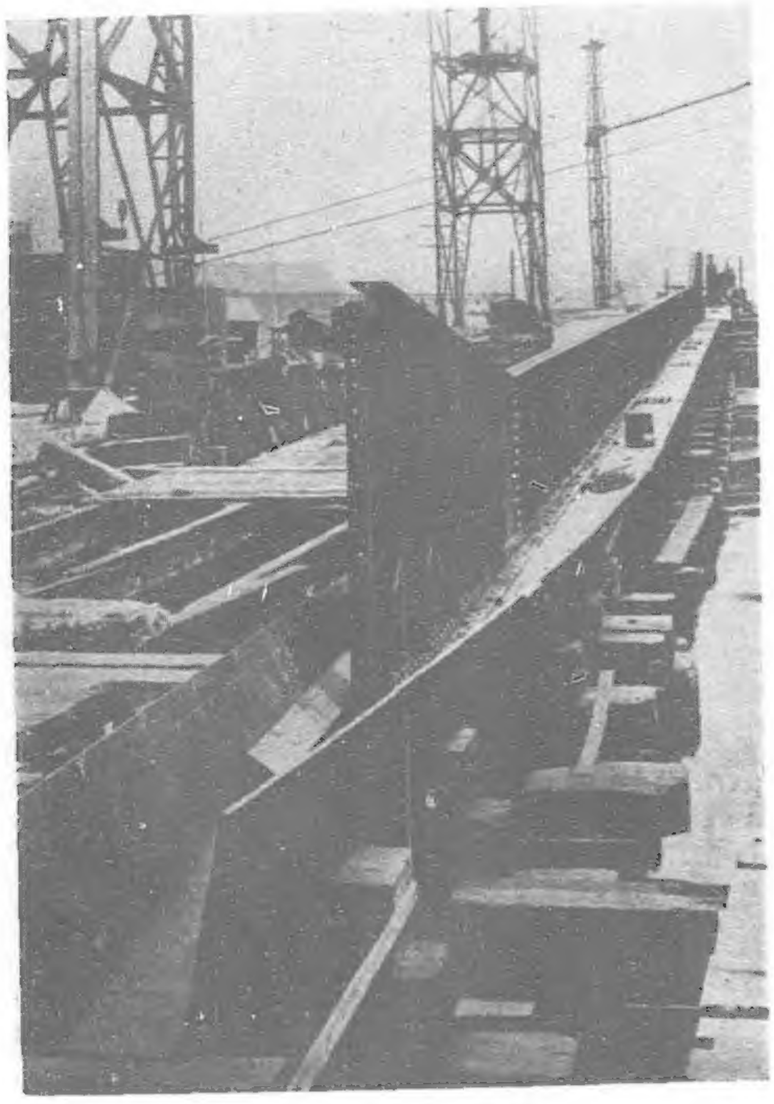
Other deck machinery consists of six electric deck cranes capable of lifting three tons, supplied by Messrs. Storkhysch, Hengelo, Holland ; two electric capstans, supplied by N. V. Machinenfabrick der Firma P. M. Duyers & Company, Koog aan de Zaen, Holland, and an electrically driven windlass supplied by N. V. "Atlaswerke A. G.", Bremen. The steering gear is electrically driven, and has been supplied by Messrs. Brown Bros., of Edinburgh. The control of the steering gear is maintained by telemotor. The refrigerating machinery has been supplied by the N. V. Grasso's Machinefabrieken, 's-Hertogenbosch, Holland, The extensive bituminous work through the ship has been supplied by Messrs. William Biggs, of Dundee and Glasgow. The vessel is fitted with an Oertz patent rudder.

New Dutch Vessel for Oriental Trade

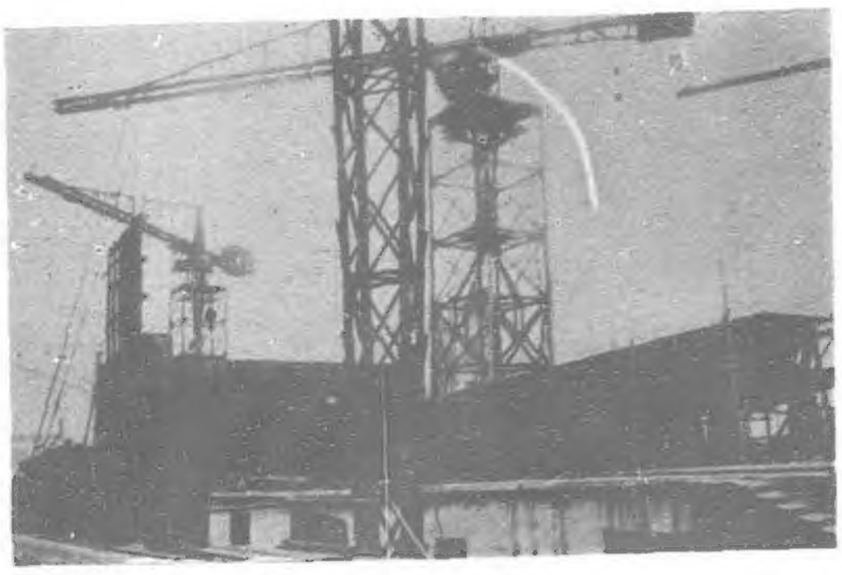
The motorship *Maros*, built by the Intermaas Shipbuilding Co., Slikkerveer, to the order of the Koninklijke Paketvaart Maatschappij, Amsterdam and Batavia, recently underwent her trials. The *Maros* is built for the highest class of Bureau Veritas for service in tropical waters, and is of the following dimensions :— Length 165 feet, breadth 28 feet 8 inches, and depth 10 feet. On a mean draft of 8 feet 2 inches she has a displacement of 818 tons and a deadweight capacity of 403 tons. There are two cargo-winches and windlasses driven by Sulger oil engines. The propelling unit is a five-cylinder Winterthur-Sulzer airless-injection diesel engine of 250 h.p., which gives the vessel a mean speed of 8¼ knots when loaded.

BUILDING THE "HEIAN MARU"

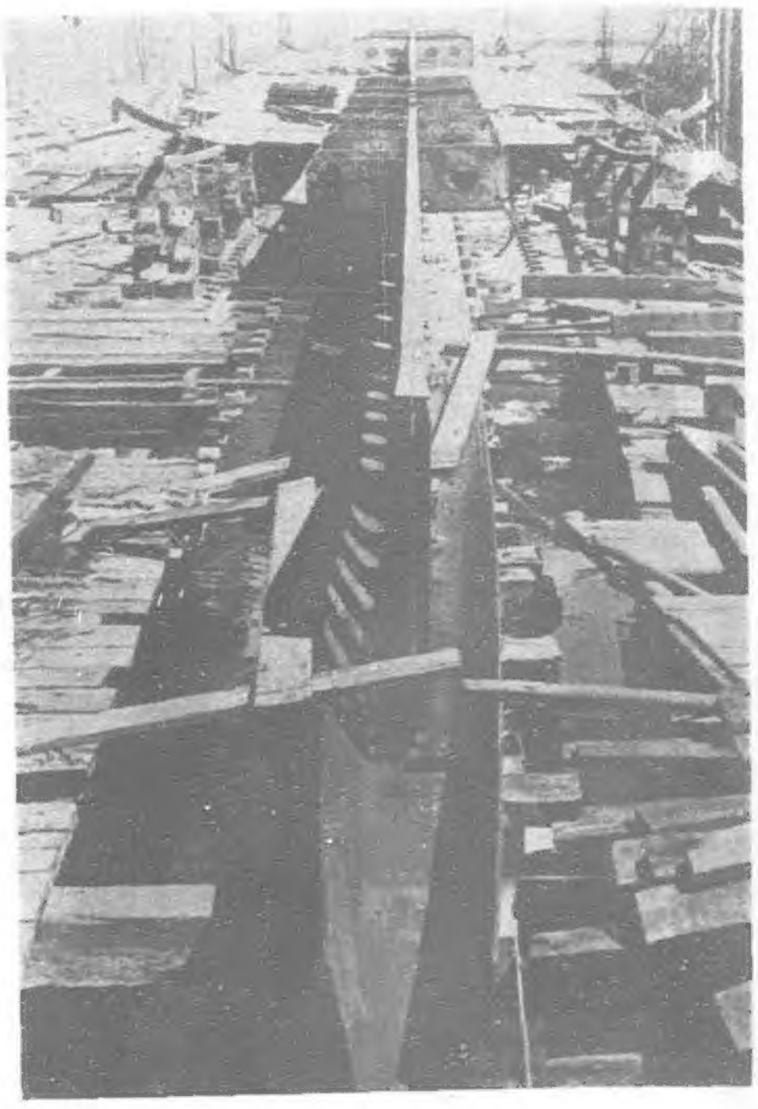
Nine Photographs Showing Various Stages of Construction of the Largest Ocean Vessel Launched into a Narrow Japanese River, at the Sakurijima Yards of the Osaka Iron Works



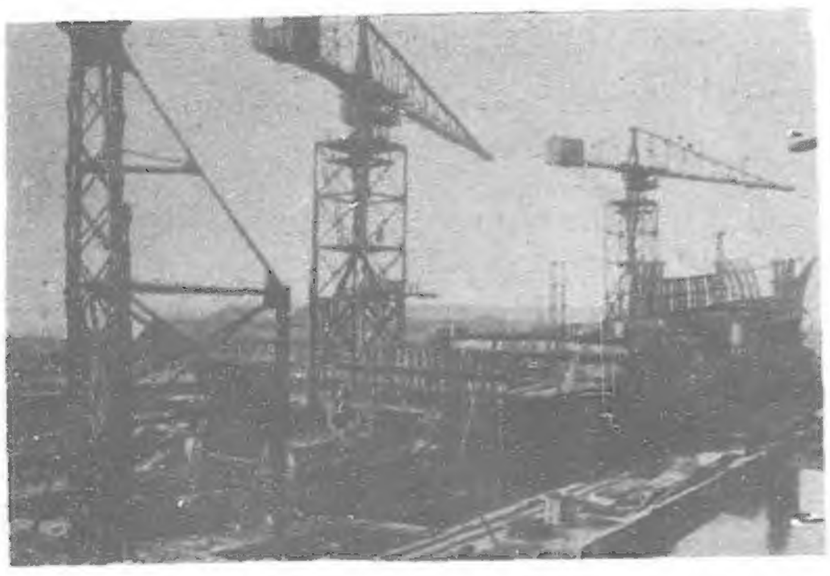
January 29, 1929



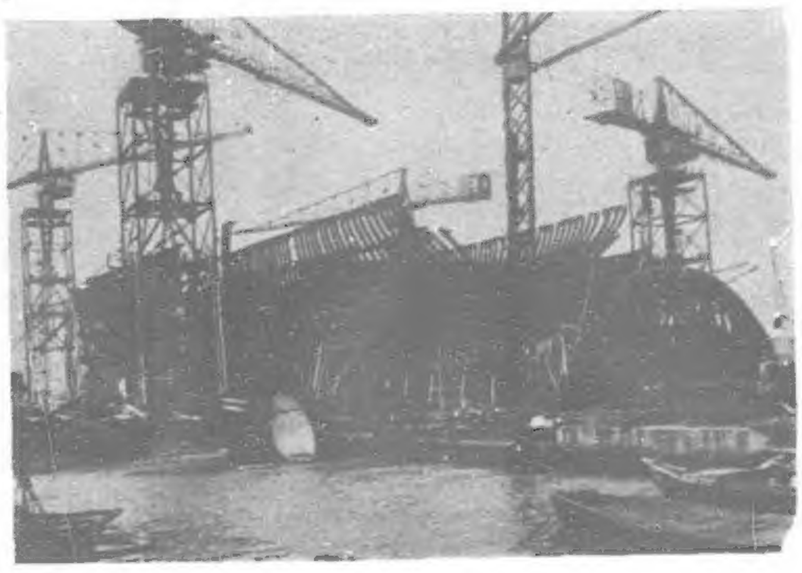
November 6, 1929



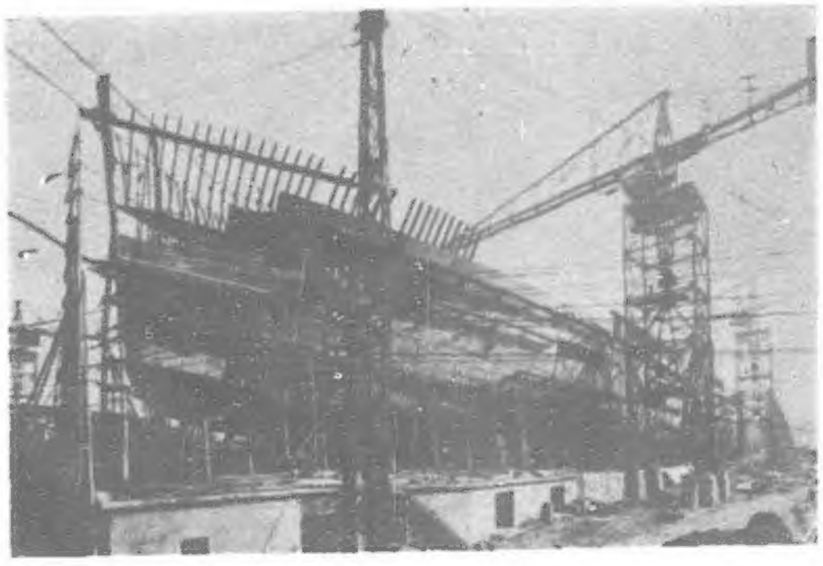
August 29, 1929



November 28, 1929



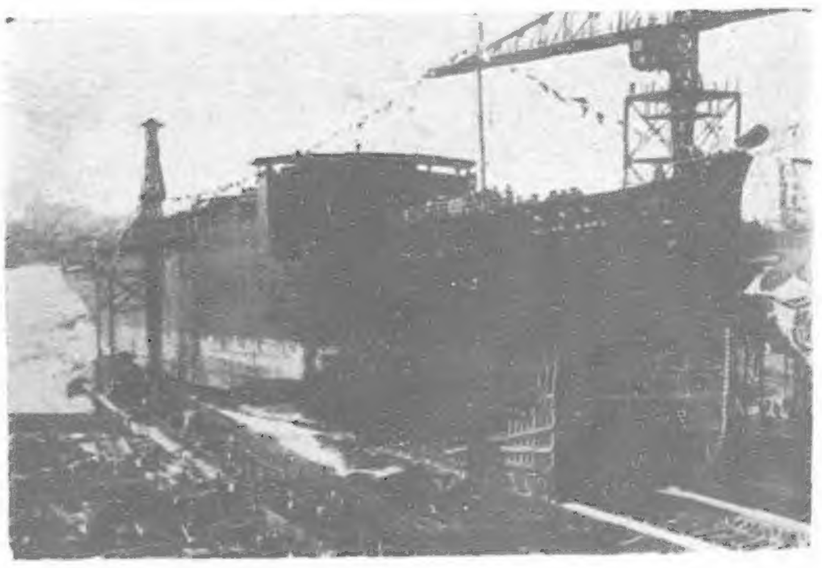
January 7, 1930



February 1, 1930

February 1, 1930

March 7, 1930



Launching Ceremony

Building the "Heian Maru"

The above group of nine photographs illustrating the construction of the new N. Y. K. Cabin Motorship, *Heian Maru*, are interesting from the point of view that this 11,600 ton vessel was built and launched at the Sakurajima Yards of the Osaka Iron Works, located in the heart of Osaka's manufacturing district. The *Heian Maru* is the largest ship ever built in Osaka and the largest ever launched into a river in Japan. The Osaka Iron Works is to be congratulated in carrying through a contract which considerably enhances the position of the port in naval construction. A full description of this vessel and her equipment was published in the June issue of *The Far Eastern Review*.

It is expected that the *Heian Maru* will be completed and ready to start on her maiden voyage across the Pacific in December.

D.K.K.'s New Vessels

The contracts for four 4,500 Diesel engined cargo vessels for the Dairen Kisen Kaisha, have been placed. Two will be built at the Nagasaki Yards of the Mitsubishi Company and two at the Mitsui Tama yard. The Mitsubishi built vessels will be equipped with 1,650 B.H.P. Mitsubishi-Sulzer engines and those constructed at the Tama yards with Mitsui-B. & W. engines of equal capacity.

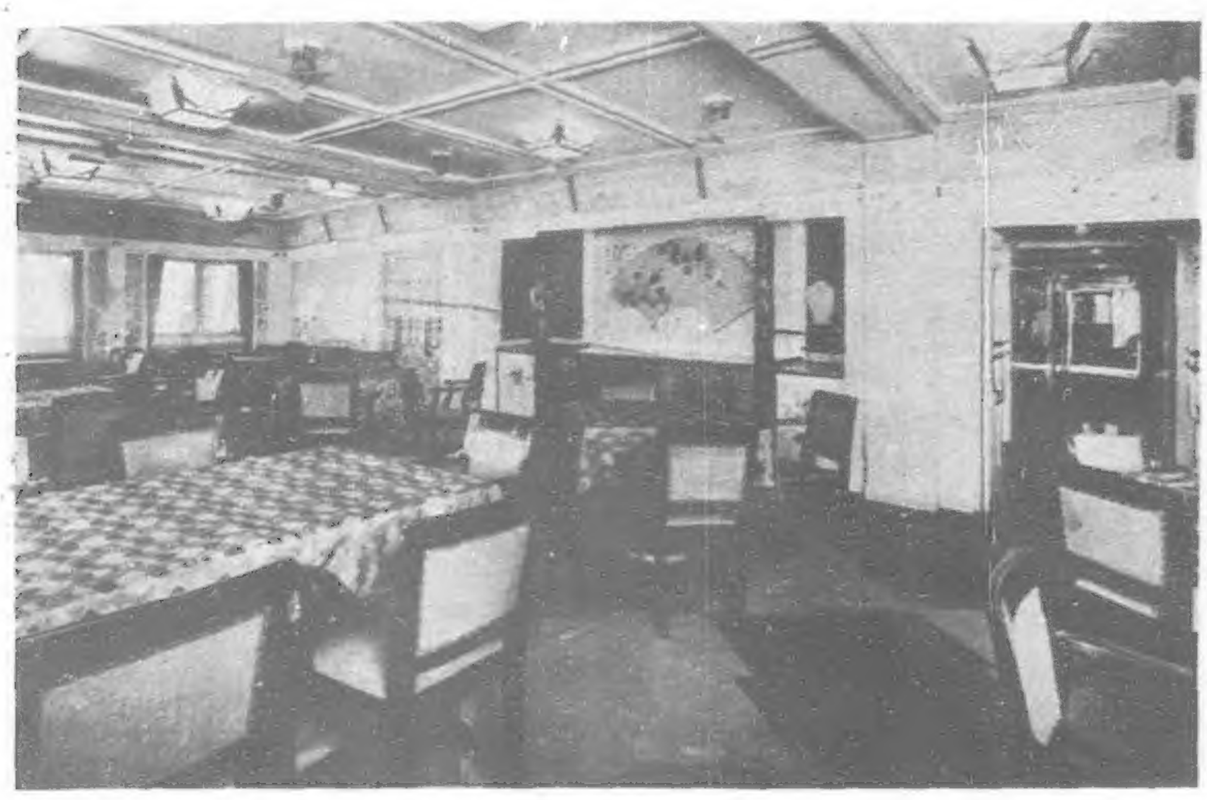
The cost of construction will be about Y.800,000 per vessel or Y.178 per ton. They are to be completed by July or August 1931. This will increase the fleet of the D.K.K. to 36 cargo vessels aggregating 175,000 D.W. tons.

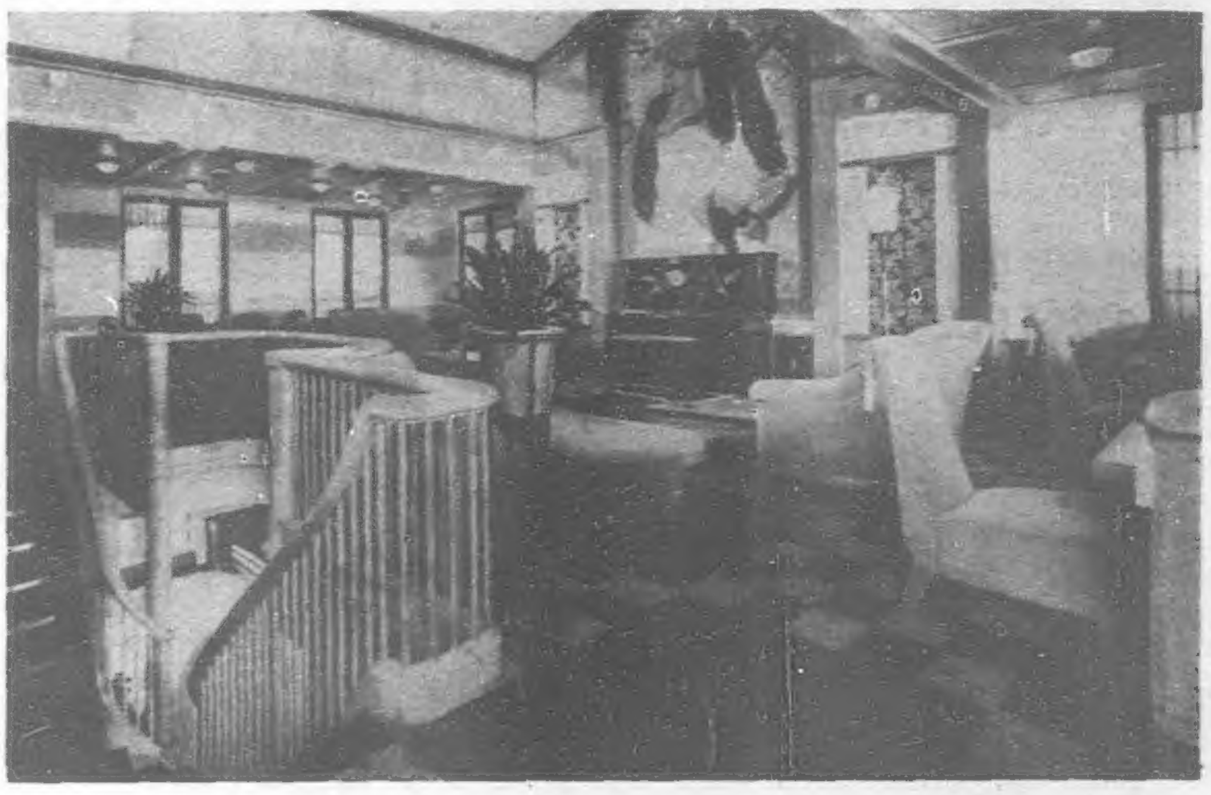
The D.K.K.'s turbine-engined passenger steamer, *Choshun Maru*, 4,000 tons, was launched at the end of May at the Kobe yard of the Mitsubishi Shipbuilding and Engineering Company.

O.S.K. New South American Motor Liner "Rio de Janeiro Maru"

(Continued from page 367).

The *Rio de Janeiro Maru* is equipped with two sets of two-stroke single-acting Sulzer six-cylinder engines, with cylinders 680 mm. bore and piston stroke, 1,000 mm., the speed being 120 r.p.m., each motor developing 3,000 B.H.P. There are three Diesel engine-driven generating sets in the engine room, each of the mbeing six cylinder Mitsubishi-Vickers trunk piston, airless-injection type, developing 350 B.H.P. at 310 r.p.m., which is directly coupled with a D.C. generator of a rated output of 230 Kw. 225 V. B.B.C. turbo-blowers, fuel and lubrication oil purifiers, various pumps, refrigerating machinery, etc., are also arranged in the engine room compact and complete. The ship is designed to reach a speed of 17 knots.





"Rio de Janeiro Maru"

First Class Dining Hall

First Class Social Hall

New 500-ton Anshan Blast Furnace

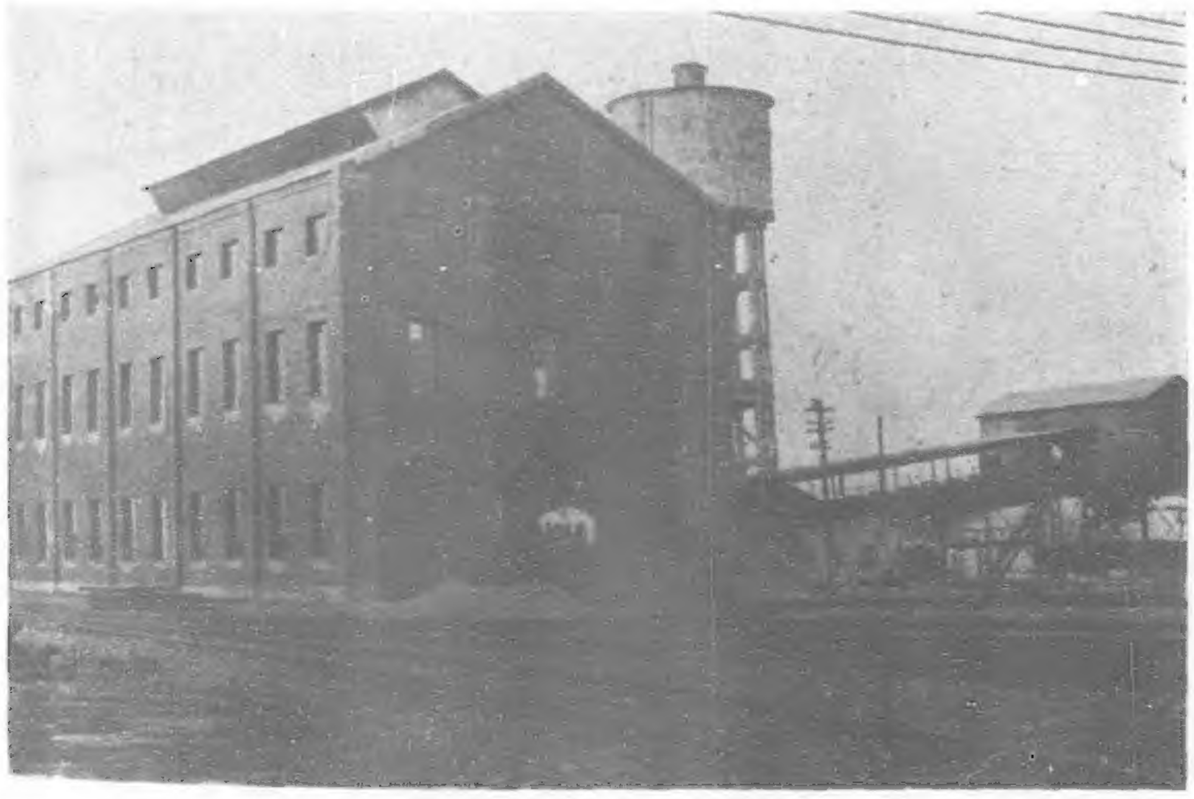
(Continued from page 356).

Summary

The basic figures for the No. III. Blast Furnace are, therefore, as follows :—

Sinter	.. 1.750t
Scrap	.. 0.025t
Coke	.. 1.000t
Lime stone	.. 0.800t
Slag Quantity	.. 0.900t

The new No. 3 furnace was blown in on March 9 last and has since been producing from 500 to 550 tons of pig iron per day.



Pig Iron Casting Plant: Capacity Maximum, 175 Tons Per Hour

N.Y.K. Liners for the Japan-Europe Service

(*Continued from page 381*).

THE SECOND CLASS SMOKING-ROOM, located at the rear of B deck, is decorated after the old Spanish style. The wall, the ceiling of light hue, and the bar counter all tone well together. The floor is covered with rubber tile. It is provided with sofas and chairs covered with wither leather or tapestry.

THE SECOND CLASS LOUNGE is located on the starboard side of B Deck adjoining the Smoking-Room. The floor is covered with ruboleum, and the furniture consists of a piano, sofas, chairs and writing desks.

THE THIRD CLASS CABINS, located on D deck, consist of the following compartments :

	No. of rooms.	No. of passengers.
Rooms for 2 persons	3	6
Rooms for 4 persons	2	8
Rooms for 6 persons	5	30
Rooms for 8 persons	2	16
Total 3rd class	12	60

These compartments are all of large size and have berths.

The public rooms for the third class passengers include a smoking-room on B deck, and a large dining-room finished in modern style on C deck. There is also promenade space on B deck.

The vessel has an enquiry office conveniently situated at the fore part of B deck, a photographic dark room, and a hospital with isolated wards.

Furthermore, besides the regular laundry of the ship, the vessel has a small laundry equipped with electric irons for the free use of the passengers.

Engineering Notes

INDUSTRIAL

NANKING PLANS MANY FACTORIES.—Plans for the early construction of a large number of Government factories including woollen mills, leather tanneries, metal works and chemical factories are ordered by the Executive Yuan in a special instruction to the Ministry of Industry Commerce and Labor and the Ministry of Finance.

The order is issued in accordance with a memorandum from the Chekiang Provincial Government, which also proposes that to promote the manufacture and consumption of native products, tax reduction or exemption from transit dues on all domestic goods as well as the holding of a National Native Products Conference should be carried out by the Central Government.

NEW CEMENT FACTORY .—The new Government Cement Factory under construction at Tsang Po, on the western outskirts of Canton, is progressing normally. The construction work has been going on for more than a year, and it is not known when it will be completed and ready for operation. At the present time the management of the works is very short of money. It has made arrangements through the Department of Reconstruction with the Central Bank of China in Canton for a loan of $30,000 with which to build the necessary wharves and godowns.

EMPIRE TUNG OIL.—The experimental cultivation in many parts of the British Empire, including Malaya, India, Africa and the West Indies, of the tree from which tung oil, formerly a Chinese monopoly worth £3,000,000 a year, is obtained, is the subject of a Memorandum by the Imperial Institute, by the Empire Marketing Board.

The Memorandum says that it is too early to state the result of the trials, but the preliminary reports from some of these countries, especially North-East India, are distinctly encouraging.

Tung oil is essentia! in the manufacture of varnish and is important to the aeroplane, electrical and linoleum industries.

RAILWAYS

NEW MANCHURIAN RAILWAYS.—Referring to the Chinese plan to build a network of railway lines in the Northeast by the Northeastern Communications Commission, Mukden, necessary investigations for the following 3 new lines having been completed, permission for their construction has been applied for to the Railway Department of Nanking Government :—

(1) Chintai-Changchiawan (Yaomen) Line ; 80 Chinese *li* in distance ; construction cost $3,000,000 to be borne by Kirin Province. Both surveys and construction work will be undertaken by the Kirin - Hailungcheng Line, and be finished in 6 months.

(2) Suihua-Wangkuei Line on the Hulan-Hailun Line ; 130 Chinese *li* in distance ; building costs $1,200,000 (to be raised by subscriptions.

(3) Chubo-Tungkiang Line, via Tungpin, Fengcheng, Ilan, Huachuan, and Fuchin, 940 Chinese *li* in distance ; building costs $30,000,000.

The last mentioned line having an important relation to the frontier defences of the Northeast, work will be taken up without further delay. Already an office therefor has been opened in Kirin.

The Northeastern Communications Commission also plan to build three trunk lines as main arteries of traffic and trade in the Northeast, following the prospective completion of the Hututao Re-construction Works.

(1) Starting from Hulutao (Lienshan Bay) and terminating at Heilo, opposite Blagoveschensk across the Amur, via the Peiping-Mukden, Tahushan-Paiyintala, Taonan-Tsitsihar, and Tsitsihar-Koshan Lines.

(2) Starting from Antung and terminating at Tungkiang via Tunghua, Hailungcheng, and Tunhua.

(3) Starting from Chinchow (on the Peiping-Mukden Line) and leading to Jehol via Yichow and Chaoyang.